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JOURNAL
OF THE ROYAL STATISTICAL SOCIETY
PART I, 1929.

THE PRESIDENTIAL ADDRESS OF MR. A. W. FLUX, C.B., M.A.,
DELIVERED TO THE ROYAL STATISTICAL SOCIETY, NOVEMBER 20,
1928.

THE NATIONAL INCOME.

To look back over the record of the Society's Fellowship during the last fifty years, as I have been doing, brings a realization, more vivid and more complete than could any other experience, of the high honour conferred by you in electing me as your President. The eminent names which are to be found in the list of our past Presidents emphasize the distinction of the office and the difficulty of the task of living up to the high standard which has belonged to it.

The last year has brought to the Society severe losses. I do not propose to repeat the list, or to elaborate the references to the work of those whose deaths were recorded in the last Annual Report of your Council. Since the date of that Report another of the great names of our roll has had to be erased from the list of living Fellows. Augustus Sauerbeck is a name known to students of price statistics throughout the world, and our *Journal* has had the honour of being the medium of publication of the results of his researches. We were glad to transfer his name from the list of ordinary to that of our honorary Fellows when he left his active work in this country to live in Switzerland, and the next issue of the list will be the poorer for the omission of that distinguished name.

The successive issues of the list of Fellows are documents of much interest, and, with the kind help of our Assistant Secretary and the office staff, who have, with their customary courtesy and diligence,

devoted much of their private as well as of their official time to providing me with the necessary particulars, I have been trying to prepare some statistics of statisticians from the Fellows' lists and the minutes of the meetings of the Council. I should like also to express my indebtedness to another helper, Mr. F. G. B. Atkinson, whose willingness to devote holiday time to such work may, I hope, be interpreted as a sign of an interest in it that may make him a useful recruit to the Society at no distant date.

To-day we have 1,068 Fellows on the active list, not including some 30 Honorary Fellows. Fifty years ago the ordinary Fellows numbered 712 and the Honorary Fellows 66. Among the ordinary Fellows of 1878 less than 30 were resident outside the British Isles. To-day we find close on 200 representatives of the Society, other than honorary Fellows, who live in other countries. They are spread, literally, from China to Peru, and while, as is natural, the majority are found in the British Empire, a large number of foreign countries are included in the addresses to which our *Journal* and other communications to Fellows are sent. The omission to notify the present address in a number of cases prevents the ascertainment of the exact total of Fellows resident abroad. The relatively large expansion of our overseas membership is a matter which may well afford us satisfaction. Nearly half the increase in our numbers reflects an extension of our connections overseas, and the growth of our numbers in these islands has been, roughly, from 680 to about 870. In 1878 our membership represented about 1 in 50,000 of the population of the British Isles. In 1928 it is 1 in 56,000. We need another 100 resident Fellows to bring our home position back to what it was in 1878. The establishment of the Study Group, now happily achieved, may assist in this task, both in furnishing a more definite reason to young and eager statistical students to join us, and also in developing the interest which may anchor them firmly within our Society.

At home, in spite of the increase in the numbers of social and political leaders who bear the dignity of Peers of the Realm, the number associated with our Society is only half as great as it was half a century ago, 14 as against 28. Only one personality is included in both these groups of peers, namely, the Earl of Rosebery, whose name has been in the list of Fellows for fifty-five years, and will, we hope, long remain there. At both dates one lady is found among the peers on our list, the Viscountess Rhondda to-day, the Baroness Burdett Coutts in 1878. The only other lady Fellow at that date was Florence Nightingale. Now we have 23 ladies, of whom 3 are on the Council. In the whole lifetime of the Society, only 9 women besides those now among us have been elected.

It is, however, not to the distinguished names of past or present Fellows that I have given most attention, but to the mass figures relating to the Society. It would weary you to try to-night to set forth the full results. There may, however, be some interest in certain of the more general results of the comparison of the list of Fellows fifty years ago with that of to-day, and a consideration of the additions to our number and of our losses in the half-century's interval. In 1878 half the number of ordinary Fellows had been less than six years in the Society; to-day half our number have been with us more than eight years. The upper quartile of the numbers in 1878 was at eleven years from election, to-day it is between seventeen and eighteen years. The fact that the average age, as Fellows, of those in the list of 1878 was $8\frac{1}{2}$ years, while to-day it is only a little short of $13\frac{1}{2}$ years, is thus not a consequence of the fact that no one in 1878 could have exceeded the age, as Fellows, of forty-five; although we have not less than 22 Fellows of longer record than that among us to-day.

In the course of the fifty years, rather over 3,000 new Fellows have been elected, and the net increase of ordinary Fellows is 356, while our relatively brief list of Honorary Fellows includes some names that were at one time on the ordinary list. Our losses were less than the new elections in the first and last decennia of the half century and greater in each of the other three. During the war our numbers fell to below 800, reaching a low level of 757 in 1917, so low a total not having been recorded for thirty-seven years previously. Happily we have recovered from the drain of that period, and our numbers now exceed the earlier maximum of 1890. The last decennium has brought an increase of over 300, a figure exceeding by a little that of the decennium following 1878. The average of the numbers of the fifty years is 903, and the average annual rate of loss is 6 per cent. The average net gain was 0.8 per cent. per annum, a figure of little interest, since, unlike the rate of loss, which has been fairly constant decennium by decennium, the rate of addition has varied within a rather wide range. The losses of the final decennium of the half-century have averaged, however, only 5 per cent. yearly, a figure strikingly low in comparison with the rates of 5.8 to 6.5 in the other decennia.

As I have said, our Fellowship to-day includes only 22 names which, without doubt, represent survivors from forty-five years ago, and thus, in the study of the list of 1878, we have, practically, the complete history of a generation. We find that, of the original 712, 345 have left the Society in their lifetime, 350 certainly, and perhaps 353, have ceased to be Fellows through their death while still in good standing, and 14 remain, including Mr. J. Russell

Sowray, who was elected in 1855 and continues to make his annual subscription to the work which has for so long a period commanded his interest and support.* The average duration of association with the Society has been 24.4 years, and the unexhausted lives of the 14 survivors cannot be expected to bring the ultimate average to more than 24½ years. If we take separately those who left while still living and those whose membership was ended by death, the former had an average duration of Fellowship of 15.6 years, the latter of 31.5 years. The difference may be due to younger entrance on the part of those who remain faithful till death than in the case of the temporary Fellows. We have no record of the ages of our Fellows, at election or at any later date, and, therefore, are not in a position to know how far the relatively long duration in the one case may be due to early entrance and a constitutional liking for statistics, and the relatively short period in the other case to temporary business interests involving association with statistics, but no strong development of a taste for statistics in themselves, changes in business conditions, or retirement from active business leading to withdrawal from our Society. Some of those who withdrew after more than forty years of Fellowship may have done so in view of the obvious approach of death.

Of those elected since 1878, about 3,000 in number, over one-third are still in the list of living Fellows. Nearly one-half left while still living, and their average "life" as Fellows was not much over the half of that stated above as applying to the similar section of the Fellows of 1878. The comparison is, however, not one of similars, nor is the proportion between losses by death and losses by retirement in the same two bodies a comparison of similars, as the survivors of the two groups form such contrasted fractions of their totals.

The average duration of association with the Society of those who, elected since 1878, have since ceased to be Fellows, has been about eleven years, and if we take together the Fellows of 1878 and those who, since that date, have both joined and left us, the average duration of their association with the Society was about fourteen years, or less than a year more than the average for all present Fellows.

As the present value of fourteen equal annual payments, beginning a year hence, amounts to 9.9 years' purchase, on a 5 per cent. basis, the retention of the present rate of life composition would appear to be justified. It was to secure some light on the problem of the life composition that I asked to have particulars extracted regarding the last fifty years of the Society's existence, and the

* Mr. Sowray's death, at the age of 98, occurred early in December.

interest of some by-products of that enquiry seemed to me to justify directing your attention to them to-night.

The Fellows of 1878, if we follow their whole duration of association with the Society, present characteristics curiously different from those which I have noted as shown by the position in 1878 or by the corresponding position in 1928, as is natural. Rather more than one-half of them were Fellows for periods exceeding twenty years, a quarter did not survive ten years of Fellowship, while a quarter survived thirty-six years of Fellowship. It was in the second quinquennium of life in the Society that voluntary retirement was at its maximum rate, namely 34 per mille per annum. After twenty-five years in the Society, voluntary retirement was a less powerful influence than natural death. I attach a table, by way of an indulgence of curiosity, in which the losses of the Society, by death during their membership, of individuals included in it in 1878, are compared with the death-rates at certain ages in the general male population of England and Wales. It may be said that the comparison has no significance. It is, nevertheless, curious to note that a rough correspondence in the growth of the average mortality figure and that of the general population is found on the hypothesis of an average age of about thirty at election. That does not appear to me, from my recollection of candidates during my service as Honorary Secretary, to put too high the age at entry, and not a few enter at ages well above that figure, which should tend to raise our losses by death. So far as it goes, the comparison does not suggest that statisticians are bad lives from the insurance standpoint.

Years from Election.	Average rates of loss of the R.S.S., per thousand of the Fellows of 1878 of the standing shown.			Death-rates of Males per 1,000 living at ages specified, England and Wales, 1938-51.	
	By Death.	By Withdrawal.	Total.	Rate.	Age.
1-5	8.6	13.7	22.3	10.0	25-34
6-10	6.3	34.2	40.5	12.8	35-44
11-15	16.4	24.1	40.5	18.5	45-54
16-20	14.4	20.3	34.7	31.8	55-64
21-25	20.6	21.0	42.5	66.0	65-74
26-30	32.7	10.6	43.3	147.0	75-84
31-35	30.8	17.7	48.5		
36-40	15.2	13.1	58.3		
41-45	56.5	10.8	67.3		
46-50	131.7	16.5	148.2		

The numbers whose Fellowship in the Society exceeded 5, 10, 15,

etc., years and who were Fellows at the beginning of the Session 1878-9, were as shown below, the total at that date being 712.

Duration of Fellowship.			Number.	Duration of Fellowship.			Number.
5 years	...	...	655	40 years	...	...	135
10 "	...	...	532	45 "	...	...	104
15 "	...	...	433	50 "	...	...	68
20 "	...	..	363	55 "	...	...	28
25 "	...	...	293	60 "	...	...	12
30 "	...	...	235	65 "	...	..	2
35 "	...	...	183	70 "	...	...	1

It is possible that some of the survivors of the original 712 may remain with us long enough to cause, eventually, some transfers at the end of the table to groups representing higher ages, *e.g.* some of the 28 with 51-55 years to their credit may survive long enough to be counted in subsequent groups.

Let us, however, leave these records of the life of our Society for to-night, and turn to the subject to which I have thought it best to ask you to devote your main attention. That subject is our National Income, and I propose to proceed from the figures so far published relating to our industrial output in 1924 and try to construct, by a procedure similar to that adopted in the Report issued in 1912 on the First Census of Production, an estimate of the value of the goods and services constituting the national income of the United Kingdom in 1924.

It might appear that, in view of the comparatively recent estimate prepared by two of the most eminent of the living Fellows of this Society, the subject has been dealt with adequately for the time being, and that I should have sought to lay before you some more novel topic. I note, however, that our colleagues who compiled the recent estimate in question looked forward to "help in explaining our new total" when the results of the new Census of Production (for 1924) should be available, and that one of them, in the brilliant lectures, published later under the title "Wealth and Taxable Capacity," delivered in the series established in memory of Newmarch, stressed the importance of the conception of national income of which the portion of the Report on the First Census of Production to which I have alluded constitutes an attempt to give a statistical measure. That it has remained an isolated attempt may appear a little strange, but it is, I believe, the fact that, apart from the occasion to which I have referred, neither in this country nor elsewhere has a like procedure been adopted for the purposes of our problem. Yet it is of the greatest importance that the conception

of the national dividend which underlies that procedure should be familiar to as wide a public as possible. The money in terms of which we express, and by means of which we measure, the national dividend, may all too readily conceal its real nature. That the nation's resources can only be increased by adding to the goods and services available for use by its citizens is a vital truth. The money expression of those resources may be increased or decreased by a rise or a fall in prices. A given aggregate of material goods may reach the hands of users by processes of greater or less complexity, carried out efficiently and economically or wastefully and expensively. Thus the money expression of income may vary while the good things of life do not become more abundant or more scarce. To proceed to our estimate of the money expression of the national income from the estimation of the goods and services which constitute that income, rather than by simple aggregation of individual incomes expressed in money, or even by the aggregation of the services of each and every industry, does, nevertheless, assist in realizing the important fact that the proceeds of our labour constitute, for the nation as a whole, the reward of that labour, and that restriction of productive effort is not the direct road to increased general welfare, as is proclaimed by some modern prophets and has been preached by earlier doctrinaires. Further, while there are elements in the problem which cannot be determined with any exactitude, that is a characteristic which this method shares with other and alternative procedures. The fact that it is in reference to different elements that estimates are necessary, for lack of ascertained data, in the different methods, is itself by no means without value as a safeguard against erroneous results. Comparisons of results reached by different procedures may direct attention to the necessity of reconsidering some of the elements making up those results.

The Census of Production enquiries furnish a means of measuring the material elements in our national income—the goods which, together with services not embodied in material goods, make up that income. No direct record of those goods is, however, obtained. The record of the output of manufacturing establishments groups together goods ready for use by final consumers and goods which serve as a starting-point for further manufacturing operations. Sufficient detail is not obtained to permit of a general and precise separation of these two classes of goods included in the output of the reporting establishments. A simple example may illustrate this. We learn the amount of wheat flour produced, but how much of this is used as material by bakers, or by other producers, how much is worked up outside the establishments covered by the Census, *e.g.* by housewives and in the kitchens of hotels and restaurants, cannot be ascertained

exhaustively under existing statutory powers, since voluntary enquiries are always ignored by at least a substantial number of those to whom they are addressed.

In the absence of a direct record, free of serious duplication, another procedure is open to us, namely, to ascertain, as exactly as possible, the value of all the materials available to our industrial establishments, and to add to it the aggregate "Net Output" of those establishments, that is, the amount by which their total output exceeded in value the total of the materials, whether raw or partly manufactured, used in producing that output. By this procedure the duplicate reckoning of the same goods, at progressively increasing values at different stages of the manufacturing processes to which they are submitted, is avoided. Let us examine the result of this calculation, which was taken in two stages in the Report dealing with 1907, but which may quite conveniently be taken in one, with, perhaps, some diminished risk of error.

The materials of industry consist mainly of imported goods, but partly of products of agriculture, of fishing and of forestry, and to a quite small degree of materials forming waste products of processes of consumption, such as old iron, rags, etc. The division of the imports (after deducting re-exports), and of the products of the branches of activity mentioned, into goods that pass to ultimate consumers without undergoing a preliminary process of manufacture, on the one hand, and materials used in industry on the other, cannot be made with great precision. From the point of view of the aggregate national income, the precision of the division is not of serious importance, though for other purposes it is desirable to make it as exact as possible. The result of a careful allocation of items is to show that the £1,137½ million by which the imports of 1924 exceeded the re-exports of that year included something like £6.10 million representing goods on which some industrial operations were subsequently undertaken. The output of agriculture in Great Britain, as reported in respect of its southern and northern divisions separately, amounted to £277 million, that of fisheries (fish landed from British fishing boats) to £18 million, and that of forestry to £2 million. The addition of an estimate for Northern Ireland may bring the total to about £312 million, including about £98 million representing materials on which work was subsequently done in industrial establishments. Taking waste products of consumption, used again as industrial materials, at the moderate estimate of £16 million, we have a total value of materials acquired from outside by the manufacturing and mining industries of the United Kingdom amounting to £751 million.

The value of these materials as received at the factories and works at which they are to undergo further manipulation is, however,

greater than this sum by the costs of handling at ports, of transport from ports or farms to factories and works, and of merchanting or agency, in addition to which charges of like character are incurred in the exchanges involved in the supply of partly manufactured materials of all kinds for manufacturing purposes. Such materials often change hands more than once at progressive stages in the processes of manufacture, as is clear from the fact that the aggregate cost of materials (and of work given out to be done on them) amounted to £2,199 million. On the basis adopted in the Report on the First Census, an addition of 10 to 15 per cent. on this account should be made to the above-named sum of £754 million, raising it to £848 \pm 19 million. To this the net output reported, after deduction of excise duties in those cases in which they were included in the value of the goods produced but not in that of the materials used, must be added. The amount of this was £1,630 million, so that the output of industry, free of duplication and of excise charges, may be taken as £2,478 million, on the basis of the mean figure for merchanting and carriage of materials.

The value of the output of agriculture, fisheries and forestry, other than the £98 million representing materials for industry, namely, £214 million, remains to be added, and the duplication involved in the inclusion both in the value of factory products and also in that of farm produce, of manufactured fertilizers and feeding stuffs produced in this country should be deducted from the total thus arrived at. The latter element in the calculation amounts to about £55 million, after making some allowance for fertilizers used by occupiers of gardens not kept for purposes of profit, and for feeding stuffs used by horse-owners and others not engaged in agriculture. We thus reach a total for the output of the United Kingdom in 1924, taken at the place of production, but not including allotment and garden produce, expressed in terms of money as £2,637 \pm 19 million. Allotment and garden produce, and, generally, the produce of holdings of less than an acre, may not be over-estimated if the figures, resulting from their addition, are taken at £2,655 \pm 20 million.

For 1907 the corresponding figures, including the produce (which may be roughly estimated as being in the neighbourhood of £40 million) of the areas now included in the Irish Free State, were £1,385 million to £1,400 million, less a sum of about £43 million representing unrefined gold bullion and silver bullion, included in the total of imported materials used in the calculation for that year, the corresponding amount of about £16 million for 1924 having been omitted from the calculation of imported materials given above in view of the disproportionate effect on gross output resulting from its inclusion.

It will be observed that the figures for 1924 are close to the double of the figures which would cover the same ground in 1907.

To arrive at the goods available for consumption in this country in 1924, there must be subtracted from the above figures the value—at place of production—of those goods, included in the total produced, which were exported in 1924, and there must be added the net imports of goods ready for distribution to consumers.

The exports of produce and manufactures of the United Kingdom in 1924 were valued at £801 million. This total included about £2 million in respect of goods not resulting from productive operations here, but forming the waste of consumption, such as old iron and rags. The charges on goods between the factory or works where they were produced and their stowage on board the ship by which they were conveyed abroad may be estimated as from 10 to 15 per cent. of the factory value. Thus the portion of the output of the United Kingdom which was exported, valued at the place of production, may be taken as between £695 million and £725 million, leaving, for home use, from £1,910 million to £1,980 million. On the basis of the means of the ranges stated, the exports represented 27 per cent. of the production of 1924.

The corresponding figure for 1907 cannot be stated precisely, since the data relating both to trade and to production in that year apply to the British Isles as a whole. To obtain figures of exports corresponding to those of 1924, the recorded exports of merchandise in 1907, namely, £426 million, should be increased by between 5 and 6 per cent. to allow for the goods produced in Great Britain and Northern Ireland which were shipped to Southern Ireland. The resulting total, valued as at factory, would represent between £390 million and £410 million. The value of the output with which this figure is to be compared, allowing about £40 million for the output of Southern Ireland, would be between £1,302 and £1,317 million, and the proportion of exports to output is about 30·5 per cent., on the basis of the means of the ranges specified. If the calculations were made on the basis of a comparison of exports and production for the British Isles as a whole in 1907 and 1924, the results are 28 per cent. of output exported in 1907 and about 25 per cent. in 1924. These figures cannot, of course, be claimed as rigidly accurate, but the extent of their probable deviation from the results of a comparison of the actual, though unascertained, facts must be quite small, and is probably negligible. They show that, whatever the comparative magnitudes of the national production in 1907 and 1924, a definitely larger fraction was disposed of in the home market in 1924 than in 1907. For Great Britain and Northern Ireland, for each £100 worth of goods disposed of in the home market in 1907,

there was shipped out of that area £44 worth, the goods being valued in each case at place of production. In 1921, for each £100 worth disposed of within our borders, £37 worth were shipped beyond those borders. The relation of the *quantities* of goods shipped abroad at each of the two dates to the *quantities* retained at home depends on the average price-change in the two classes, and it is by no means impossible that prices changed in different proportions in the two aggregates of goods. I shall return to this point later.

The home products kept for disposal within the country represented in 1924 a total of £1,910 million to £1,980 million. The net imports of goods ready for distribution amounted to £463 million, a sum which, with £640 million for materials, raw and more or less manufactured, for use in industry, and about £34 million for materials for agriculture, makes up the aggregate net imports of £1,137·5 million of the year 1921.

In addition to the c.i.f. values of these goods, there must be added customs and excise duties amounting to £227 million before the charges of transport and distribution are considered. The value of the goods at this stage may thus be taken as lying between £2,600 million and £2,670 million. Part of the total relates to goods delivered direct by makers to consumers, and the values recorded in respect of these need no addition except in so far as the work of delivery (if any) may have been carried out by agencies forming no part of the producing establishments. The aggregate of the goods which appear to belong to this class may be estimated at £530 million. At the other extreme are goods requiring the services of wholesalers, of transport agencies and of retailers in their passage from makers to consumers. The total of such goods may be estimated at somewhat over £1,800 million, and that round figure may be used in view of some doubtful allocations. For the total addition to be made to the values of these goods at the place of production (or discharge from importing vessel) there was estimated for 1907 an amount of from one-half to two-thirds of the corresponding values, taken in the mass, and some critics considered the additions inadequate. For 1924, a somewhat lower scale appears appropriate, partly in view of the extended preparation by producers for the sale of their goods, in making them up in convenient packages, for example, partly in view of the possible reduction of total charges through the growth of large retailing organizations, whether in centralized premises or with multiple retail shops. Such organizations may, perhaps, by performing a large part of the functions of the wholesaler as well as those of the retailer, and by elimination of wasteful movement of goods resulting in some cases from a separation of those functions, reduce the total charges of moving goods from factory to customer. I

propose to calculate those charges on the basis of from 40 to 60 per cent. on the value of the goods as they leave the hands of the producer's employees, a basis supported by the opinion of a high authority consulted on the subject. These percentages give a figure of between £720 million and £1,080 million for the distribution costs of goods valued at £1,800 million in makers' hands.

Besides goods with no charges for distribution and those with full charges for all stages of that process, there is an intermediate class of goods passing through a merchant's or agent's hands, and bearing also charges for transport. The balance left for this class is between £270 million and £340 million. At the average rate of 15 per cent., calculated for handling, agency and transport for this class for 1907, the charges would lie between £40 and £50 million.

Adding these charges to the value of the goods before distribution, an aggregate value lying between £3,360 million and £3,800 million results.

This total includes the goods which are required for the replacement of capital used up in the course of the year's operations, except in so far as the work of maintenance and replacement may have been carried out by the employees of the establishments concerned, the materials used being included in the general total of materials the cost of which has been taken into consideration in arriving at the net output. For 1907 the additional amount allocated for depreciation, after a careful examination of relevant information, was £180 million to £190 million. No new and reliable data of a sufficiently comprehensive character are at my disposal, and, in default of them, I propose, after considering the capital goods included in the income total, to make a provisional estimate of about £300 million on this account, reducing the value of that part of the national income which is made up of material goods to £3,050 million at the lower limit of the range [£3,275 | 225 million].

To complete the estimate we need to add the value of the services which make up the rest of the national income, services of persons and of various kinds of consumers' capital. For the former estimate various classes of such services were specified. Among the more important are :-

- (i) The services of dwelling-houses, hotel and restaurant buildings, hospitals, schools, etc., estimated at about £150 million for 1907. For 1921 an addition of one-half may probably be made to this figure.
- (ii) Payment in money and in kind for domestic, hotel and restaurant service, estimated at £80 million to £90 million for 1907. The number of persons concerned has been

reduced, but an addition of 40 per cent. would appear to be justified for 1924.

- (iii) Passenger services on railways, light railways and tramways, less the cost of coal and the maintenance outlay attributable to these services and included in the Census Returns. So far as the service is rendered to travellers for business firms, it has already been accounted for in the value of the goods. The gross receipts increased by nearly 90 per cent. in the former case and by 135 per cent. in the latter, being £78 million and £29 million respectively in 1924. Road motor services have now to be added. It should be noted that the transport of exported goods from farm or factory to port, having been excluded from the calculation relating to goods, will be brought to account here.
- (iv) That part of the charges for postal services which arises from services to private persons, *i.e.* excluding business correspondence, etc. The gross revenue, including telegraph and telephone business, amounted to over £55 million in 1924-5.
- (v) Professional and artistic services, other than those rendered by persons in the employ of the central or local Governments, *i.e.* clerical, medical, teaching, literary, scientific, artistic, musical and dramatic services, together with so much of legal, banking, insurance and other professional services as were not concerned with the manufacture or distribution of goods.

A total of £350 million to £400 million for the above and other services was estimated for 1907, and for 1924 a similar basis of estimate would give not less than £600 million to £700 million. The figures are obviously very rough. Their addition to the estimate for goods raises the total to £3,650 million for the lower figure of the range and £4,200 million for the higher.

An additional item of income, not represented by goods or services made available in the United Kingdom, is the addition to investments abroad from revenue accruing abroad. From the surveys of the situation appearing in the Board of Trade Journal under the title of "The Balance of Trade," it appears that a balance of £86 million, including £12 million arising from an excess of exports of bullion and specie, was calculated as available for making such additions in 1924, a figure to which some small addition may be proper in the light of Sir Robert Kindersley's recent investigations. This balance is, however, reached by taking credit

for ships' stores and bunker fuel supplied in our ports to foreign-going vessels, and for financial services rendered here for which payment is made by beneficiaries abroad. These items have been covered in the preceding survey and counted in the total reached for the national income, and the amount left to form an addition to that total is neither relatively important nor determinable with any exactitude. It may be sufficient to add £50 million on this account.

Thus, basing the measurement of national income primarily on the evidence furnished by the Census of Production, regarding the material goods forming its major part, we reach a total of £3,975 : 275 million. The range of 7 per cent. on either side of the middle figure could probably be reduced by 1 or 2 per cent. with safety, and the total stated as between £3,750 and £4,200 million. A more extensive and detailed knowledge of the costs of distribution would enable the limits to be drawn closer together.

The total is approximately double the amount calculated for 1907, after making an appropriate deduction for the income of Southern Ireland, included in that total. For the British Isles as a whole, the calculation for 1907 gave as the National Income £2,038 ± 120 million, and the deduction in respect of Southern Ireland may be estimated at £60 million to £70 million.

THE QUESTION OF PRICE CHANGES.

The figure thus arrived at for 1924 is, of course, subject to amendment when the results of correspondence, not completed when the Preliminary Reports on individual trades were issued, are made available in the Final Report. The amendments are unlikely to require any serious modification in the total.

The comparison of the calculated income in 1924 with that of 1907 raises at once the question of the degree in which the figures express a merely nominal increase due to the rise in prices. What has been the average change in the prices of the goods and services constituting the national income? The index-numbers of wholesale prices, calculated in the main from the prices of materials, not of finished goods, give results not wholly in agreement. The Board of Trade pre-war index, if linked up from 1913 with the post-war calculations, gives a rise in average prices of 88 per cent. The *Economist* index gives a rise of 87 per cent.* The *Statist* (Sauerbeck) index gives 75 per cent. as the amount of the rise. If the two first

* It appears from the announcement made in the *Economist* of 15th December that the revision of the Index now undertaken would reduce this figure to about 81.

of these indices were to apply, the equivalent at 1907 prices of the national income of 1924 would be about £2,100 million, or about $6\frac{1}{2}$ per cent. in excess of the income of Great Britain and Northern Ireland in 1907. The occupied population appears to have increased in numbers by double this percentage, and the total number living increased by about 10 per cent. The real income per head of the total population, or of the nominally occupied population, appears thus to have decreased by a small percentage, and if numbers actually at work are taken instead of numbers nominally occupied, the result appears to differ little from that calculated on total population, namely, a decrease of 3 per cent. Any higher figure for the average increase of prices must yield a larger proportionate decrease per head. Only by taking, in place of the mean figures for income, either a figure approaching the lower limit of the calculated range for 1907, or the higher limit for 1924, can we arrive at the conclusion that the average real income per head had been maintained. The question of the real measure of price change is thus a matter of serious importance in the interpretation of our results. For the purpose of measuring that change, we cannot assume without examining the question that indices calculated from the prices of materials, raw or but slightly manufactured, can be applied as if they represented the average price change in a mass of finished products, together with a total of personal services representing in money a substantial proportion (about one-fifth) of the finished goods. We cannot assume this, not merely because of the formal difference in character of the items to be assessed and of those actually contributing to existing index-numbers, but also because there is some presumptive evidence that finished goods have, during the period with which we are concerned, shown price movements different from those of the materials of industry. We are all familiar with the fact that the Ministry of Labour issues index-numbers of retail food prices and of the cost of living which show a greater rise since the outbreak of war than is evidenced for the wholesale prices of materials by the best known index-numbers, such as those cited earlier. Further, the calculations of the Board of Trade relating to the changes in average values declared for goods imported and exported indicate that raw materials rose in average value before 1913 more than manufactured articles, and since 1913 the rise has been greater for manufactured articles than for raw materials. For retained imports as a whole a rise of 63 per cent. is shown between 1907 and 1924 and a rise of 96 per cent. for exports. Among the imports the materials of industry and raw food products dominate, while manufactured goods and partly manufactured materials dominate among the exports. The percentage changes shown cannot be applied directly to the problem before us, but they

may serve as a warning against the rash application of particular index-numbers to problems to which they are not appropriate.

If it be the fact that, over the whole of the period under consideration, finished goods have advanced in price in a greater proportion on the average than the materials from which they are made, then the price factor appropriate for use in connection with the figures of national income is higher than 188, and if it be higher than 200, the national income of 1924 must be judged to be less, expressed in quantity of goods and services supplied, than in 1907. Shorter hours of labour and irregularity of operation in 1924 as compared with 1907 would, in that case, have offset the increase of numbers engaged in remunerated work and other features tending to an increase in the real income.

The examination of the problem of the extent of the price change may be aided by a consideration of some of the aggregates reached in the course of the preceding calculations leading up to the estimate of national income.

First in order there was reached an estimate of the total of the material goods produced, taken at the place of production. The figure reached was £2,655 \pm 20 million. An examination of the details indicates that, in this total, Food, Drink and Tobacco figured for not far short of a quarter of the whole. In arriving at this total only those goods are taken into account which had reached the form in which they were ready to be passed to the consumer, including hotels and restaurants as consumers for this purpose. The duplication arising from the use by one of the food trades, or by agriculture, of products of other food trades, or of agriculture, as materials (*e.g.* grain used by millers, flour by bakers, sugar by confectioners, etc.) has been eliminated as far as that can be done without a detailed examination of individual schedules with this feature definitely in view or, even if such a detailed examination were made, in the absence of information regarding the character and amount of the materials used, owing to the limitations of the statutory powers conferred on the Board of Trade. Buildings and works of construction account for about one-ninth of the total; ships and machinery for about 10 per cent.; clothing for about 10 per cent.; coal (domestic, exports and bunkers) for somewhat less than 5 per cent.; books, newspapers, magazines and paper for about 4 per cent., a figure which includes the cost to advertisers of the publicity afforded; furniture and household equipment for under 3 per cent.; motors and cycles and carriages for about the same percentage, and other finished goods, prominent among which are the gas, water and electricity consumed for other than industrial purposes, and such items as soap and drugs, bring up the total of goods ready for consumers to rather over four-fifths of the

total calculated for goods made. The remainder consists of goods exported, at whatever stage of completion. The bulk of these are grouped in our Trade Returns as "Articles wholly or mainly manufactured," and among them are classes of goods which, in the countries to which they are sent, pass without further manufacture into the hands of consumers. The cotton cloth, a strip of which serves as a garment for the native of tropical or semi-tropical regions is an example of this. The clothing industries in this country convert such material into clothing, and thus woven fabrics cannot, as a whole, be classed among finished goods in such an enumeration as that attempted above. Viewed from this standpoint, about 70 per cent. of our exports consisted in 1924 of goods not yet fully manufactured, subject to the consideration that certain of them, even though not fully manufactured from the point of view taken in the present survey, are, in fact, not subjected to a manufacturing process after leaving this country. The distinction between intermediate goods and final goods is not absolute.

When we pass to the next stage of our survey, and consider the goods available in 1924 for use in this country, but still at the place of production or, in the case of imports, at port of landing, the make-up of the aggregate is quite remarkably different in one respect. Exports have disappeared and net imports of final goods have been brought to account. The Food, Drink and Tobacco group, at this stage, acquires an importance, relative and absolute, much greater than, indeed almost the double of, that which it possessed at the preceding stage. This is partly due to an addition of about one-half to the total in respect of food and drink imported ready for distribution to consumers, partly to the bringing into account of the duties of customs and of excise falling on this class of goods. The duties on spirits, wine and beer, on tobacco and on sugar are the main part of this addition. Food, drink and tobacco at this stage represented nearly one half of the £2,635 + 35 million which was estimated as the aggregate value of the goods available for consumption in 1924, taken prior to distribution. Some changes occurred in the other groups previously named, arising from the balance of imports and exports, the latter being generally in excess, but they were, for the most part, of small relative importance. In the case of coal the exclusion of exports halves the figure, which now covers domestic consumption and bunkers only. Machinery and ships, stated above as forming about one-tenth of the final goods made, represent about one-twelfth of those available for use. Changes in the proportions of the other categories specified are but fractional in relation to the total.

In passing to the third stage three changes of importance are

involved. First, the addition of the charges of distribution where they are incurred. Next, the putting aside of specific classes of goods as the physical representation of depreciation. Last, the addition of a mass of services representing something like one-fifth of the amount to which the addition is made.

The adjustment in respect of net revenue arising abroad which was invested abroad was of insufficient importance in 1924 to call for special discussion in the present connection. The results of the three processes named are of considerable importance in reference to the relative share of the different categories in the final total of national income. I will not pretend to have determined with any high degree of precision the final distribution, but it may be useful, as illustrating the character of the problem that has to be faced, to set out the results of even a tentative calculation. I should like to stress the fact that the figures are at best rough approximations.

Class of Goods.	Approximate Proportions of chief Constituents in		
	Goods made.*	Goods available for use.†	National Income.
Food, Drink and Tobacco	25	48	41½
Buildings and Works of Construction	11	11	5
Clothing	10	10	10½
Machinery and Ships	10	8½	3
Books, Newspapers, etc.	4	4	3
Coal	5	2½	2½
Furniture	3	3	3
Motors, Cycles and Carriages	3	3	2½
Gas, Water and Electricity	2½	2½	1½
Other Goods { Home Use	7½	7½	7½
{ Export	19	-	-
Total Goods	100	100	82½
Services	-	-	17½
Total Goods and Services	100	100	100

* At place of production.

† At place of production or landing, prior to distribution.

In this tentative presentation of the make-up of the three aggregates, gas-coke used for domestic purposes has been added to coal as specified earlier, and it has been necessary to make a separation of the supplies of gas, water and electricity between such as were used for domestic and public purposes (street lighting and watering) and such as were used for purposes connected with the production and distribution of goods, or for traction. The available information

on which such an estimate may be satisfactorily based is by no means adequate for the purpose, but the rough magnitude of the shares in the general totals is probably indicated with sufficient accuracy for a general survey, which is all that is claimed for the preceding table. Even if a proportion—for example, a tenth part of the figures in the top line—were deducted and distributed among the other lines, the general purposes of the table would not be lost.

The most cursory glance at such a table will make it clear that, unless price changes have been roughly uniform under the different heads mentioned, or manifest an accidental balance, the measure of the average price change will not be the same for goods made, for goods used and for goods and services together. In the first column, the price movement of raw products and intermediate goods, as well as of final goods, exported will have an influence on the general aggregate. In the second column, the fact that duties are included in the prices of food, drink and tobacco, while in the first column the prices are duty-free, may have an important influence on the aggregate movement of prices affecting the total to which the second column relates. To illustrate, as actual data are not at present at my disposal, let us assume that, on average, the prices of food, drink and tobacco, as a whole, taking the home-produced and the imported goods ready for distribution, and these only, advanced by 75 per cent. between 1907 and 1924. The duties in 1907 were about 8 per cent. of the value of the food as so limited, and in 1924 they were approximately 20 per cent. The comparison will be—

	1907.	1924.
Value of goods	100	175
Duties	8	35
Total	108	210

and the rise in prices to be taken into account in the second column will be over 91 per cent.

The Report of the Board of Agriculture and Fisheries indicates an advance in prices of goods sold off the farms of England and Wales of about 77 per cent. between 1908 and 1925. The net imports of all goods, whether ready for consumption or having the character of materials for agriculture or for industry, included in the Food, Drink and Tobacco class, rose in average declared values by about 66 per cent. in the interval 1907-24. How far the separation of the materials from the goods used without previous manufacture or, in the case of imports, goods already completely manufactured, would

result in differences of importance in the measure of price change, I am not this evening in a position to determine, and I must be content with directing attention to the somewhat complex character of the problem before us. It is possible that the greater rise of prices indicated for the Food, Drink and Tobacco contribution to the second than for that in the first column may offset the absence from the second column of the export element, the price change in which appears likely to have been relatively high. But it is not determined, and may not be determinable satisfactorily from the data secured, whether the whole of the first column yields a lower average than its last element. The second, third and fourth headings, for example, relate to goods not specified in definite units of quantity applicable to large groups. It follows that the determination of the extent of the price changes in the aggregates there represented must be a matter of estimates rather than of calculation from data furnished in the Census of Production Returns or in any other readily available body of records. Whether a satisfactory comparison of average prices of motor or other vehicles can be made between 1907 and 1924 may also be questioned. The units produced in 1907 were by no means the effective equivalents of those produced in 1924, and a factor of comparison is not readily available.

The third column of the table differs from the two others, not only in the different degrees of relative importance of the different groups, but in a general scaling down, in view of the addition of the group of services, with which the item of foreign investment from revenues arising abroad has been merged in the table. The price question as related to this new group is a matter of the price payable for the use of existing houses, for conveyance by railway, tram, omnibus and other vehicles, for amusements concert or theatre tickets, for example—for domestic service, for the services of the police, for the services of doctors and lawyers and for other services. Some of these services have advanced little in price in the interval dealt with, some have advanced as much as or more than the general run of material goods. In some cases there were services in common use in 1924, as there were material goods available, of a kind not available at all, or not generally accessible in 1907. Thus the picture palace, which occupies so important a place in the general life of the great mass of the population to-day, represents a new element in that part of the national income which consists of amusement and recreation. The wireless broadcasting service is another. If these things represented a larger fraction of that part of the national income which consists of services than, in fact, they do, they would present a serious obstacle in the way of obtaining even a theoretical measurement of the price factor to be used to reduce the aggregate

figures for 1907 and 1924 to a basis permitting of direct comparison. A further difficulty is the absence of standards by means of which to compare the quantities of service of the different kinds rendered in the two years compared. It is not, for example, a comparison of similars when the cost of travelling ten miles in a modern motor omnibus is compared with the cost of a journey of equal length in one of the old horse omnibuses, while such services were not established in 1907 in many districts in which motor services had become an important facility in 1924. Thus the practical problem of calculating a reliable measure of price change in respect of one-sixth (according to our estimate) of the national income is by no means readily solved, even if the difficulty associated with the replacement of one class of service by another, and of the introduction of new elements into the mass to which we have to apply a measuring rod, could be ignored or surmounted.

The problem of weighting an index-number of wholesale prices is not directly touched in such a table as that we have before us. This table deals with goods at their final stage only, while the measurement of wholesale prices must take account of goods not yet at their final stage, since the supply of goods and services against money, and of money against goods and services, is concerned with intermediate goods and raw materials as well as with final products. Other elements must therefore be introduced, and the resulting index-number is likely to be thereby rendered unfitted for use in connection with the price problem as affecting any one of the three columns of our table.

The price factor needed for the interpretation of the net output is again different. It was estimated that the materials worked on—acquired from outside our industrial organization—were of a value about half that of the net output, and, consequently, one-third of the value of the finished goods. If, therefore, the price factor for the finished goods differs from that for the ultimate materials, the comparison of net outputs corresponding to different levels of prices will require a price factor less than that for finished goods, if it be the less of the two, and greater than that factor, if it be the greater.

It may be well to refer here to a point passed lightly in the earlier calculation, namely, the magnitude of the depreciation allowance. The value of the capital goods included in the aggregate of disposable goods does not appear to exceed £550 million by much, if at all, a total made up mainly of the value of machinery, ships, commercial vehicles, buildings and works of construction. Of this £300 million were assigned to replacement of equipment, a sum somewhat smaller relatively to the total of disposable goods than

was considered appropriate for 1907. It formed, however, as great a proportion of the capital goods apparently available, and it appeared not unlikely that the work done on repairing and replacing plant in some industries may have been relatively more important in 1924 than in 1907. I refer here to work done by the staffs of the firms concerned, the materials used in that work being included, with those used in making saleable products, in the totals recorded for materials. A relatively active trade year like 1907 may have been characterized by less of this putting of the equipment into order, and providing for replacement of worn-out or obsolescent plant, than a year like 1924, in which some of the industries likely to be concerned were, to say the least, not overpressed with current work for customers. The balance not needed to make good the depreciation of equipment forms the physical representation of additions to capital, and to this balance there falls to be added additions to property abroad, and additions to stocks of durable consumers' goods. As to the amount of the latter, I attempt no estimate. It would appear that, unless my estimate of goods to be classed as capital goods is too small, or the extent of maintenance work included in the Census returns was greater than I have supposed, or the additions to durable consumers' goods were relatively large, the estimate of £450 million for savings, that has been made on high authority, may be difficult to reconcile with the details of the Census figures.

The question of stocks of consumers' goods brings to the front a point of some importance which is worth considering. In the final months of 1924 the index-numbers of wholesale prices, compiled for general use by various authorities, show a rise, continued into the early months of 1925, but followed in the spring of that year by a fall. In 1907 the later months of the year showed a fall in prices. The price movements differed for different classes of goods, so that any influence on the Census returns would vary from industry to industry. If prices are rising, the calculation of materials used, involving stocks brought into the year, purchases during the year and stocks remaining in hand at the end of the year, may lead to an under estimate of the materials used to the extent to which equal stocks of the same goods have been valued at higher prices at the end of the year than at the beginning. A simple physical equivalence may not be represented by equality in the values taken into account. For finished goods as well as for materials or partly finished goods a like tendency may be looked for. Rising prices thus tend to an under-estimate of cost of materials, at least in some cases, and falling prices to an over-estimate. Thus net output may have been exaggerated in 1924 and under-estimated in 1907. The extent of the net effect of the price changes will depend on the relative importance of the trades whose

materials were rising in price in comparison with those whose materials were falling in price. If the balance of items in the Board of Trade index-number of wholesale prices is not widely different from that of the stocks of materials, and of finished goods, affecting the Census returns, the effect of the price changes on the measure of the net output will not have been of great importance to the results of our calculation. It is to be observed that in the cases in which the business year ended between March and June, 1925, we are dealing with returns for a period when average prices were lower at the end than at the beginning of the period.

Before closing, I should like to refer again to the relation of exports to production. In the preceding survey this has been calculated for 1907 at 30·5 per cent. and for 1924 at 27 per cent., the figures relating in each case to Great Britain and Northern Ireland. If we make a similar comparison of net imports with production, taking, as before, the goods produced as at factory or works and excluding duties and gold and silver movements, we find for 1907 that net imports at port of landing amounted in value to about 43·5 per cent. of the value of the goods produced, and in 1924 to about 43 per cent.

It may be useful to add the percentage figures expressing the proportions of the value of exports f.o.b. to the value at place of production of goods made. For 1924 the figure, relating to Great Britain and Northern Ireland, is slightly in excess of 30 per cent., and the estimate for the British Isles as a whole is 28 per cent. For 1907 the figure for the British Isles is 31·5 per cent.

In view of the fact that estimates of the national income in 1920 have been given by high authorities assessing income at about the same figure as now appears to apply to 1924, I am tempted to suggest that an estimate, of by no means negligible weight, can be made of the production of the country from the figures of imports and exports, so long as no large change in the general structure of the country's economy has occurred. The closeness of the agreement between the relation of imports to production in 1907 and in 1924 lends at least plausibility to that view.

Let us examine the results of such a calculation for the year 1920, a year of very high prices, but a year, comparison with which has been a habit with some students of affairs. The net imports of that year were valued at £1,710 million. This figure applies to the British Isles as a whole, and for that territory the 43½ per cent. relation of imports to production, calculated for 1907 for Great Britain and Northern Ireland, is replaced by a figure of about 41 per cent. The total of which the £1,710 million of retained imports of 1920 represents 41 per cent. is approximately £4,200 million.

For the British Isles as a whole, the f.o.b. value of exports in 1920 was £1,334 million, while the proportion of the value of exports, f.o.b. to that of goods produced was estimated at 31·5 per cent. for 1907 and 28 per cent. for 1921. The total of which £1,334 million represents 28 per cent. is £4,760 million, and that of which it represents 31·5 per cent. is £4,235 million.

The figures of national income calculated both for 1907 and 1924 exceed the figures of total goods produced by a little under 50 per cent. An addition of 50 per cent. to the £4,200 million resulting from the calculation from the net import total gives £6,300 million. A similar addition to the results of the calculation from the export total gives £7,140 million if the 1924 ratio is taken and about £6,350 million if the 1907 ratio is taken. If services in 1920 were of less relative importance in the national income than in more normal years, the charges of distribution were high. It does not appear to be going too far to say that an estimate of between £6,000 million and £7,000 million for the national income (Great Britain and Ireland) in 1920 is consistent with a relation of trade to production not violently contrasted with that of 1907 or of 1924, while an assessment of the national income of that year at £4,000 million practically requires us to accept the view that our net imports were nearly 65 per cent., and our exports were 50 per cent., of our production of material goods in the year. These proportions are, I submit, not easy to credit. In naming for the income of 1920 a figure of £6,000 million or more, it is not suggested that the quantum of goods and services available in that year was greater by a half or more than that available in 1924. The prices of material goods in 1920 were well over 50 per cent. higher than those of 1921, and the suggested £6,000 million or more for 1920 may connote a smaller real income than the £4,000 million of 1921. It appears incredible that it can have been so much smaller as is implied in assessing its money equivalent at something in the neighbourhood of £4,000 million. In saying this, I am not unmindful that it is not infrequently the function of the statistician to correct popular delusions and even to show that the incredible—as it appears to the hasty observer—is none the less real.

One further point may be worth attention, namely, the significance of changes in the Index of Production, which is getting itself established among the informative work undertaken by the Board of Trade. As indicated in the published material relating to the index, it should represent the fluctuations in the net output of industry. Assuming that, even in its present incomplete form, it can be used in that sense, the figure of 107·5 for 1927 would mean that, measured in the money of 1924, the net output of 1927 was greater than that

of 1924 by some £122 million. The excess of imports over exports was greater in 1927 than in 1924 by £51 million. Using the estimates published by the Board of Trade showing the value of 1927 trade at 1924 prices, this figure expressed in terms of 1924 values was raised to £111 million. What the change may have been in the agricultural contribution to the total is not, so far as I know, shown definitely in any publication of the responsible Departments. The details given in the official reports appear, however, to indicate, if not an exact balance of increases and decreases, at any rate no large change, measured in terms of valuations of 1924.

We have thus an increase in the total of goods ready for distribution of £233 million, bringing the total to £2,868 million, and the increase of customs and excise duties carries this to £2,884 million. Except for the last addition, the figures are in terms of money of 1924. Wholesale prices have fallen by 15 per cent. between 1924 and 1927, as measured by the Board of Trade index-number, and if this figure should be at all close to that applicable to the mass of goods covered by the total value of £2,884 million, the equivalent of that total in money of 1927 would be in the neighbourhood of £2,450 million. Adding the proportion for distribution and services estimated to apply for the Census years, the figure indicated for the national income in 1927 is about £3,650 million. This is, of course, a very provisional estimate.

If we calculate for 1927, as for 1920, on the basis of the import and export totals, the net import figure for 1927, namely £1,095 million, is 43 per cent. of £2,540 million, and the export total of £709 million is 30 per cent. of £2,360 million. The value of goods made in 1927 might be estimated on this basis to lie between £2,360 million and £2,540 million, an estimate not conflicting with that based on the Index of Production calculation, and yielding for the national income of 1927 a total estimated at about £3,550 million if the relation of exports to production be assumed to have been similar in 1927 and in 1924 and at about £3,800 million if the relation of net imports to production be taken as alike in the two years.

These figures, like the preceding figures of national income, do not include the effects on the nominal total of incomes of the redistribution of portions of the national resources through taxation of citizens generally to provide the means of paying debt-interest to fundholders, pensions to sufferers in the war or dependents of those who were killed, relief under the Poor Law and other redistributions not representing payments for services rendered currently by the recipients of the sums concerned.

PROCEEDINGS OF THE MEETING.

MR. UDNY YULE : It is my duty this evening to move the Vote of Thanks to our President for the Address which he has just delivered, but I hope I may assume your permission to carry out a prior duty. We are welcoming to the Chair this evening an old friend and colleague, a Fellow of the Society for over thirty-five years, and one who has held the office of Honorary Secretary for, I think, something like eighteen years. I am sure I may have your permission to wish him, on behalf of all Fellows present, a successful tenure of the Chair and, I hope, an enjoyable one.

Our President has chosen as the subject for his Address this evening the estimation of the national income by means of the estimation of the goods and services which form that income. It is a subject to which a considerable part of his report on the Census of Production of 1907 was devoted—a portion of that report which was by no means the least interesting, but which I think was by no means the most easy to follow. I confess I still do not find these calculations at all easy to follow, at least until they have been set out in the form of an account. I think you will agree, however, that they have been stated very clearly, although you may find it necessary carefully to consider at each step what you are including, and why you are including it. If I may confess it, Mr. President, when I read your Address I had to puzzle over one item a good deal, and wondered whether you had not already covered it—namely, that item of £50 million on account of our investments abroad. I confess I still feel worried over that item, and if you could give a little explanation of the justification for including it, it would make my mind a little happier. It seemed to me that a good deal of it must have been covered by the items already dealt with. I have no doubt that I am wrong, but if you could explain that point I should be glad.

Many of those present must have read that earlier report on the Census of 1907. But I wonder if any of us thought that it would be no less than seventeen years before another Census would enable Mr. Flux again to return to the subject and form a fresh estimate of the national income on the same basis. Or did any of us suspect that the new estimate would prove so difficult to interpret, owing to the great change in prices and the alterations in the kinds of goods and services concerned? May I take this opportunity to express the hope that a Census of Production will in the future take place at much shorter intervals, and be on each occasion a complete

census so as to give us reliable and comparable estimates at fairly short intervals?

The President estimates that the national income of 1924 was somewhere about £3,975 million, approximately double the amount calculated for 1907—after, that is to say, the appropriate deduction has been made in the case of 1907 for the exclusion of Southern Ireland. The greater part of the remainder of his Address unfortunately has to be devoted to showing how very difficult it is to attach any precise significance to that ratio. The total money income has about doubled—the income per head increased by some 80 per cent. But what about the real income? As the President points out, there is no index-number of prices for services, and index-numbers for wholesale prices are not applicable to finished goods. The short table on p. 18, and the discussion of that table, very well brings out the great difficulty, which is a difficulty that would, of course, occur in endeavouring to interpret any estimate of the national income arrived at by any method.

I find it a little difficult to separate wholly in my mind the present Address, which I read in proof, from that other document which I read only a week or two before, and for which I presume the President is also largely responsible—the Summary of the Preliminary Reports on the Census of Production, published with the *Board of Trade Journal* of September 20th. In that Summary we are told that “it is suggested by calculations made from a number of trades, in which quantity data were obtained in the Census returns, that the average advance in prices of products between 1907 and 1924 was in the neighbourhood of 100 per cent.” But of course that estimate remains an estimate for the output of industry alone, and it does not cover other items nor services. Is one not perhaps unreasonable to demand any interpretation in terms of real income when both goods and services have changed so largely during the interval? The motor-car of to-day, or of 1924, is not the motor-car of 1907. The textiles of to-day or 1924 are not the textiles of 1907. The electrical goods of to-day are not the electrical goods of 1907, and so on. As the President points out, services have also changed. The motor 'bus services of 1924 are not comparable with the horse 'bus services of the earlier years. Street lighting was different; roads have now enormously improved; all sorts of services in 1907 were different in kind. And when goods and services have changed so largely qualitatively, does it not become impossible even to ask for an interpretation of money changes in terms of “real” changes?

There is one other point which really arises in part, I am afraid, out of that Summary of the Preliminary Reports on which I would also like to ask the President if he could clear up my difficulties.

Large sections of the population are not very close to the economic man who consumes simply a random sample out of all the goods and services available. The working classes are one class who diverge to some extent from that average. The Ministry of Labour index-number for the cost of living of the working classes shows an increase between July 1914 and 1924 of some 75 per cent. The data in the last Abstract of Labour Statistics, for whatever they may be worth, show an increase between 1907 and 1914 of about 7 per cent., making a total increase of something like 87 per cent. over 1907-24. This is just about the same as the increase in wholesale prices and rather more than the increase in the national income per head. So that it would look as if any body of persons to whom the cost of living figures applied, in so far as they retained the same share of the national income, were slightly worse off at the later of the two dates.

But we may look at the matter from another standpoint. The industrial working classes draw their wages from the net output of industry, and the net output of industry per head more than doubled between the two dates. If the industrial working classes kept the same share of the net output, their condition ought to have improved. But, on the other hand again, the wage statistics in the last Abstract of Labour Statistics suggest an increase of something like 77 per cent. only between the two dates, or markedly less than the increase in the cost of living. What exactly has been happening? Are the industrial working classes obtaining now the same or a smaller share of the net product than they were in 1907? Are they better off or worse off? I am venturing to ask that question really to clear my own doubts. It was a question that rose in my mind when I was reading the Address, and it seemed to be one to which a more definite answer should be possible than the question concerning national income. One must obviously allow for a margin of error in the "cost of living" figures, but at least they can be stated with reasonable precision.

In conclusion, I think we are greatly indebted to our President for bringing the results of his investigation on the national income in 1924 in the first place before this Society. That the results are difficult to compare with the calculations of 1907 is a misfortune that would apply to any calculations. In any case they give a basis for comparison into the future, which I hope will not be so difficult, and I am sure they will frequently be referred to for that purpose.

I beg formally to move the Vote of Thanks to Mr. Flux for his valuable and interesting Address.

SIR JOSIAH STAMP: I should like to associate myself with the proposer by saying what a gratification it is to me personally to see our old friend, Mr. Flux, in the Presidential Chair the highest honour

the Society can offer—and what a satisfaction it is that it has not come to him at a late stage of his life, with all his work behind him, but while he is still in the full tide of his magnificent contributions to statistical life and literature.

I believe that we follow the general convention of Societies like this in that we do not criticize Presidential addresses; we only express our thanks for them and comment on them. In the case of other Societies the reason is well known; it is that the Presidential Address is either given by such an eminent insider that his words are Olympian and *above* criticism, or else by an eminent outsider whose words are beneath criticism!

I would like in a few minutes to make some comments upon the general aspects of the work that the President has put before us. He had confined his attention to a comparison with his own earlier work—similar work done so many years before.

It is important to remember that certain conventions valid for one idea of national income are not valid for another, but if examined they would throw a flood of light on the President's criticisms of the estimates for 1907.

The results of one convention were those given by the direct method used by Professor Bowley and myself.

Basing the measurement of national income primarily on the evidence furnished by the Census of Production, the President states the total as lying between £3,750 and £4,200 million—approximately double the amount calculated for 1907—whereas the nearest comparable type of income out of the various definitions of national income, given in the recent investigations of Dr. Bowley and myself, gives £3,700 as against the lower limit, £3,750, and £3,900 as against £4,200 million as the higher limit. The midpoints are not greatly different.

But there are two distinct things here, making it necessary to examine both types and the difference of their connotations. It is always desirable to attempt these reconciliations and to see where the differences arise.

The conclusions that were arrived at by Dr. Bowley and myself were that the real home produce income per head of 1924 did not differ appreciably from 1911. Mr. Flux's comparison is with 1907, and between 1907 and 1911 there was a marked movement. There is nothing, therefore, in these conclusions at all contradictory, but I want to point out that the Census of Production method really takes income at a slightly different point from the other method; it looks at the goods physically at the point of their final disposition, as though they were in the hands of the consumer, whereas the income-tax method, which is ultimately based upon accounts and accountancy,

really stops short of that point, and takes the goods in the hands of the final trader. In one case income is the physical production of goods during the year as though they were equivalent to the amount consumed. In the other, it is the sale of goods in the year (that is, production plus initial stock, less final stock). One is a consumer income and the other a production income. In a quickly moving difference of quantity or price the differences are important. If the total amount of goods without any great change in price in the hands of the shops at the end of the year was greatly different from the beginning, under the accountancy method that surplus is not considered as profit. The only thing counted as income is the actual thing that has been finally put into the consumer's hand. That gives rise, of course, to very important considerations, and it is quite possible that there is a considerable sum in this particular year. Certainly in 1920 the influence was very important. If you take a substantial change in prices at the beginning and the end you get a very striking result by adopting the accountancy convention, which with its maxim of the stock-taking principle, "*cost or market price if lower,*" never puts the value of the stock *up* if the prices have risen, but puts it down if they have fallen; in other words, debits the actual profits of the year with a secret reserve for loss on sales in the following year.

Think of what happened between December, 1919, and March, 1920, or December, 1920, and March, 1921. In the latter period there was the most colossal drop known in modern times, and the effect of valuation of stock at the end in making a secret reserve would have been to cut out a large sum from realised profits for all purposes of computation of income, in respect of anticipated losses on stock sold in the following year.

So not only does the census method differ from the accountancy method in regard to large differences in initial and finishing stocks, but it also has an important effect when prices change. Moreover, this cannot be measured merely by the *average* change in price level, because even if the price level has remained stable, those elements which have gone up will fail to register the difference between the two methods, but the compensating elements that have gone down will still register an important difference, inasmuch as the accountancy rule only works one way in the change of prices. You get, therefore, the same effect with a stable price level if the "scatter" of prices is greater at the end than at the beginning.

A second kind of convention of accountancy that does not come in the Census of Production relates to depreciation. Take, for example, the case of these bricks and steel girders, the President says "this particular lot of bricks and girders cannot be counted as

income because they were used as replacements." The accountancy convention ignores altogether actual replacements of the year. It says, "What was the depreciation due in the year?" It substitutes for the physical actuality a notional deduction from gross profits which is correct on a long-distance plan. It therefore does something that is not physical at all in the Census of Production sense. If the society is moving quickly, and in times of great additions of machinery, the physical replacement is necessarily a much less sum than the actuarial amount of depreciation that would be written off in the account.

There is a third thing I might mention. The President, of course rightly, has not taken into account those features of income which are not for services—excepting for services of past heroes and savers—those transfers through income tax which go to form new notional incomes, and not new physical incomes, but he has included in his values those customs duties which are ultimately utilised for the payment of services like any other expense or price.

But in so far as the fund of income tax is not sufficient to pay war loan interest and pensions, and the balance and other forms of social expenditure come out of customs and excise, the President has included in his total something which he had sought to exclude.

I throw out these remarks to show that there is a difference between any aspect of a physical application of the goods produced between the beginning and the end of a year and a valuation of income or profits which depends upon accountancy conventions, particularly those conventions which throw upon a particular year a burden of anticipated losses in the future.

The price level in changing may be a compound of very great increases in the prices of some goods, and particular falls in others. The accountancy convention would ignore this, whereas the cases where prices had fallen would be the secret reserve; merely because the price level does not change, does not indicate that this accountancy convention is not at work.

These differences might form the subject for a particular and precise investigation, and I hope some day someone will undertake such a work.

THE PRESIDENT: The way in which this vote of thanks has been proposed has quite moved me, and I thank you very much for what has been said.

Mr. Yule invited me to deal a little further with a point which, when I was preparing the address, I felt might have had a little more attention. It would have been easy to pass over this foreign investment item, and its insertion was, in effect, notice that the point of principle

had not been overlooked. I conceive that we have to deal with receipts from abroad of certain goods (which were either reshipped unaltered or used here in some way), and we send abroad certain goods which we have made. Both these classes of goods have been taken into account in the course of the survey, and we have thus to consider how far the materials from abroad belong to us, having been paid for by the exports and the rights to income from abroad, of the year. It was from that point of view, and the consideration that, after we had balanced off our right of ownership in imports there was left a further right of ownership, provided by our exports and claims, that led me to believe it was impossible to avoid reference to that particular element in the year's income. I hope I have been able to indicate the nature of the justification for including that item in the total. On the other hand, I am very much interested in the things that Sir Josiah Stamp said. They seemed to me to put on a broader basis the discussion of such surface difference as there appears to be between the results I have given and those reached by himself and Professor Bowley. I do recognize that the fields are not the same, and I must say that I did not feel, taking the difference in the fields, that there was much challenge in the one figure as regards the other, especially when regard is had to the fact that some of the data available and necessarily used when their estimates were made have been replaced by others which would give a somewhat higher figure.

As to what may be said of estimates for other past years that have been made by various people, I was not thinking of one estimate alone when I expressed certain views in the course of my address. The point of view that Sir Josiah Stamp has put is of very great importance, and anybody who wants to use a particular estimate must think about what the estimate represents before he attempts to use it. It would seem to be useful that any such person should be reminded of the possibility that some other estimate, known by the same name, but more appropriate to the purpose in hand, might be arrived at.

There is one other point that was raised by Mr. Yule as to the relation between the growth of net output and the growth of wages. I hope that, when the Final Report is issued, we may have results which will provide us with a sound comparison of direct wages with net output. The net output remunerates not only the persons directly employed by the firm and included in its total of employees; it covers also a part of the services of a good many other people. That has been referred to in other parts of the discussion either to-night or in the documents mentioned by Mr. Yule, and there may have been in the interval of seventeen years a sufficiently considerable change, in some cases at least, in the relative importance of services of outside organizations. I will illustrate this by one example. In the soap

trade the extent of advertisement in 1924 was much larger than that of 1907, and this stimulus to sale was undertaken to a large extent by the producers.

A MEMBER of the audience objected that this was not so in the case of soap, as, owing to the combine and amalgamation, there was not the need for advertisement that existed formerly.

MR. FLUX : If I am wrong, and I do not think I am, some other illustration would be more appropriate than the soap trade. The point of importance is that we cannot satisfy ourselves by looking at the number of regular employees of a firm. We must look behind and approach the point of view of American investigators, who deal with total income by sources of production and estimate the net contribution of each particular industry to the total income of the community, a very instructive procedure.

Sir Josiah Stamp quite wisely tried to stimulate us to a little philosophizing over the differences between the three roads of approach towards what we call by one and the same name—"the national income."

As the result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

Prof. Costantino Bresciani-Turroni.
William Robert Craine.
Hubert Mansfield Draycott.
Harold James Exley.
Ronald Charles Forster.
Francis Charles Gardiner.
Thomas Greenhalgh.

George Stanley Hawthorne.
Albert Hill.
Richard Matthews.
James Innes Miller.
Leonard Charles Perkins.
David Pollak.
Paul R. Rider.

*Corporate representative :—*Brenda North Stoessiger, *representing the*
(Gramophone Company, Limited.

THE INTERPRETATION OF PERIODICITY IN DISEASE PREVALENCE.

By H. E. SOPER, M.A., of the Statistical Department of the
National Institute for Medical Research.

[Read before the Royal Statistical Society, December 18, 1928,
the President, MR. A. W. FLUX, in the Chair.]

Introductory.

PERHAPS no events of human experience interest us so continuously, from generation to generation, as those which are, or seem to be, periodic. Whether it is the return of a comet, sunspots, wet weather or business "cycles," the interest of the man in the street and the assiduity of the mathematician—amateur or professional—is always stimulated. Since periodic, or at least oscillatory, secular trends are very common indeed in the experience of those who deal with the records of sickness and mortality—in fact, in the ordinary use of language an epidemic which never varied in its demands for victims would be something of a contradiction in terms—medical literature is full of discussions of waves, cycles and periods, even if the definition of their vague words has sometimes been to seek. Perhaps no epidemic disease has had so much attention of this kind paid to it as measles. Nearly fifty years ago, August Hirsch laid down the law upon the matter very firmly. He began by remarking coldly that, "as in the case of smallpox, many observers think they have discovered a *periodicity* in the recurrence of these local epidemics (of measles)." He then catalogued the people who, as he said, thought they had discovered periodicities, those who plumped for two to three years, those who found three to four years, and so on. He then catalogued the places where the recurrences had been, as it appeared, quite irregular, and finally pronounced judgment as follows:—"The recurrence of the epidemics of measles at one particular place is connected neither with an unknown something (the mystical number of the Pythagoreans), nor with 'general constitutional vicissitudes,' as Köstlin thinks; but it depends solely on two factors, the time of importation of the morbid poison, and the number of persons susceptible of it. The same law, accordingly, applies here as in smallpox"*. This, even for the time at which it was written, was perhaps a little too magisterial, particularly as there might be some doubt whether the "law" of

* *Handbook of Geographical and Historical Pathology*, by A. Hirsch. Vol I (1883), p 161.

smallpox epidemics *were* so simple. But that the accumulation of susceptibles—since more than 90 per cent. of all children born in Western Europe and surviving infancy pass through an attack of measles—is an important factor of the oscillations or periods of epidemics has been adopted by the great majority of epidemiologists. Indeed, the probability of that hypothesis has always been, implicitly or explicitly, the greatest obstacle to the acceptance of the interpretation placed by the late Dr. John Brownlee upon the striking results which the method of periodogram analysis yielded in his hands. Very few people would entertain any explanation, however ingenious, which had no place for the variations in numbers of susceptible children imposed by the “laws” of natality.

In the course of an examination of possible methods of forecasting the incidence of the common zymotics which I undertook at the suggestion of Professor Greenwood, I was led to re-examine this problem of measles and, with the view of obtaining numerical results, was led to adopt the simplest mathematical postulate that would describe in a first measure the generally accepted mechanism of epidemic measles, if the accumulation of susceptibles were really the prime factor: to compare the deduced results with the observed facts and then to modify the primary hypothesis. In this research I was merely following up the trail blazed by Sir William Hamer more than twenty years ago, only in detail departing from his methods, and I am not without hope that the endeavour now to be described may prompt others to push parallel lines of attack and incidentally bring about helpful discussion.

§ 1. *Infection Interval. Mass Action. Periods.*

The mathematical picture intended as a first approximation to a continuous measles epidemic is formed thus.

Conceive a community into which is drafted a perpetual flow *all* of susceptibles possessing three characteristics, viz. (1) an equal susceptibility to a disease prevalent in the community, (2) an equal capacity to transmit the disease according to a law, when infected, and (3) the property of passing out of observation when the transmitting period is over.

Then the course of the epidemic will depend upon the law of infection assumed.

We may suppose, for example, that the disease is acquired as the result of an over-accumulation of doses of infection above what can be dealt with by the resisting powers of the body, or, on the other hand, that it is acquired instantaneously. We may suppose, again, that after acquisition the disease has powers of infecting

Fig. (3)
 EPIDEMIC CURVES DEVELOPED ARITHMETICALLY FROM
 NO. OF CASES NEXT INTERVAL = NO. OF SUSCEPTIBLES at present interval
 NO. OF CASES LAST INTERVAL \times ACCESSIONS per interval

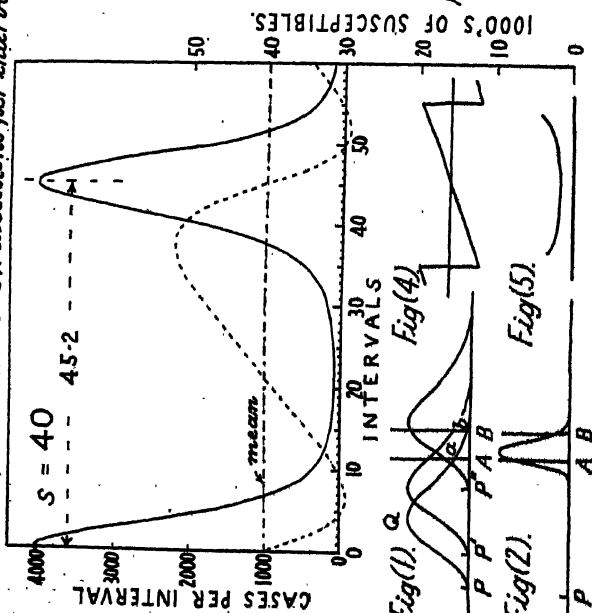
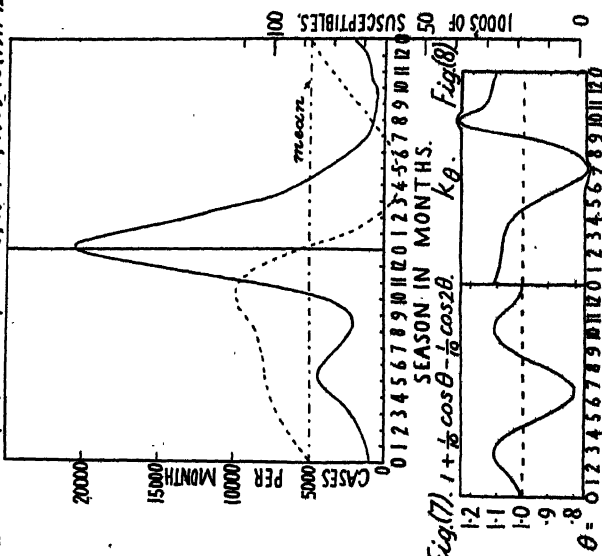


Fig. (6)
 GLASGOW MEASLES CASES PER MONTH
 ADDITION OF SIX BIENNIA
 1901-2, 1903-4, 1905-6, 1907-8, 1909-10, 1911-12.



others according to some law of intensity with lapse of time, or we may suppose, in the opposite extreme, that there is a certain incubation period at the definite end of which all infecting power is concentrated.

If the power of transmitting infection is some function of the lapse of time from a definite infection instant, then the matter would have to be treated in this wise. Let the ordinates of the curve, $PQab$, Fig. 1, whose area is unity, be proportional to the power of infecting at instants after the instant P when infection was taken. Then if AB is the interval for which we desire to estimate the number of new "cases," the previous "case" at P would for the reckoning count a certain fraction of an entire case, namely, the area $ABba$. Other cases, at $P'P''$. . . , would, as the curve is moved, count differently, and thus it is seen how the infective material governing the number of cases during AB is to be reckoned as a certain integral of the prior cases.

If, as is probably true for measles, the power of infecting others is concentrated within narrow limits about the end of an incubation period, then the graph will show as Fig. 2, and we are approaching a condition in which the number of cases between A and B will depend on the number of cases in an equal interval removed from AB by the incubation period.

It is probable that, although the picture of a precise interval and an instantaneous power of reinfecting at the end cannot be argued to portray any known disease, yet the interval from "taking" to "mean giving" is so much of the essence of the course of an epidemic like measles that many of its features can be reproduced by making the "instant" hypothesis, that would not be greatly modified by supposing infectings to be grouped either side of the mean "instant" or "point of time" terminating the "interval."

The instant or point infection law being accepted, it is next assumed that a process analogous to "mass action" governs the operations of transmission and that, other things equal, the number of cases infected by one case is proportional to the number of susceptibles in the community at the instant, and that, if this is x , whilst m is the "steady state" number of susceptibles, when "one infects one," then $\frac{x}{m}$ cases will arise from one case at the end of the interval.

Since the synthetic epidemics to be made do not depend on absolute sizes of communities, we relate m and a by the quotient s defined by

$$m = sa,$$

and think of a community as characterized by a time element s ,

the time the accessions a must accumulate to give m , the steady state charge of susceptibles. The space of time s is a measure of the "seclusion" of the community, a large s arguing few interminglings of the sort that conduce to infection, and it will be shown that if the incubation interval is τ and the repletion time is s , then the period of small epidemics is, under the laws taken, $2\pi \times$ the geometric mean of s and τ .

If, then, zdt are the cases and a suffix is employed with the meaning of advancing the time, and the incubation period is taken as unit of time measurement, we have, in the simple case,

$$z = \frac{x}{m} \times z_{-1}$$

and, since the change in x (number of susceptibles) is usually small in the unit interval (about a fortnight for measles), we write this,

$$z_{\frac{1}{2}} = \frac{x}{m}, \text{ or } \frac{z_{\frac{1}{2}}}{z_{-\frac{1}{2}}} = \frac{x}{sa} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

and interpret $z_{\frac{1}{2}}$ as the number of cases in the unit interval succeeding the present instant, and $z_{-\frac{1}{2}}$ as the number of cases in the unit interval preceding the present instant, and read it,

$$\frac{\text{no. of cases next interval}}{\text{no. of cases last interval}} = \frac{\text{no. of susceptibles at present instant}}{s \times \text{accessions per interval}}.$$

The epidemic curves, as Fig. 3, *e.g.*, were drawn from machine calculations made step by step by this formula, supposing 1000 susceptibles added each interval, or step, and taking $s = 20, 30, 40, 50$, so that the steady state numbers of susceptibles are 20,000, 30,000, 40,000 and 50,000. A start was made at a peak, with $z_{\frac{1}{2}}$ equal to $z_{-\frac{1}{2}}$, and consequently $x = m$. The successive values of x are obtained by adding 1,000 susceptibles each time and subtracting the number of cases in the last or preceding interval.

The result is a series of epidemic curves showing all the features found by Sir William Hamer for his composite London measles curve,* among them the asymmetry. I do not find any damping,† and the curves appear to repeat themselves precisely.

A rather serious epidemic starting-point was taken, namely, when the cases were four times the accessions (that is, four times the number of cases characterizing a steady state, without oscilla-

* Roy. Coll. of Physicians, Milroy Lecture, 1906. Hamer analyses his observational curve, and his theory and method are followed in this investigation.

† Damping or lowering of successive peaks is a feature to be expected when infecting power is supposed to last for a finite time, but on a point infection hypothesis there can be no damping. See Appendix III.

tions), and under these conditions, with epidemics repeating at each period, of a fourfold height, the periodic times were found to be,

$s = 20$	30	40	50	intervals,
period = 31.9	39.1	45.2	50.3	intervals.

From the analogy of pendulum swings it is to be expected that the more serious epidemics will swing slower than the lighter ones, and it is possible to obtain the periods of infinitesimal epidemics, that is, small disturbances from a uniform equality of cases and accessions, under conditions approximating to those experienced, to test this point.

Periods. If the incubation interval is τ , the equation of the epidemic curve of the kind presupposed is,

$$\frac{z_1\tau}{z_0\tau} = \frac{x}{m} \text{ and, } \therefore x = m + \int_0^t (a - z)dt, \therefore \frac{dx}{dt} = a - z. \quad (2)$$

where z = cases per unit time,

x = number of susceptibles,

a = accessions of susceptibles per unit time,

m = steady state, or level, number of susceptibles, when one infects one,

and the time t is taken from an instant when susceptibles were level.

Let $z = ae^u$, so that u is an index measure of cases, . (3)

$$\therefore e^{u_1\tau - u_0\tau} = \frac{x}{m}, \text{ or } e^{\delta\tau u} = \frac{x}{m}, \text{ in the usual notation.} \quad (4)$$

If the changes are small in the interval and $(\delta_\tau u)^2$ and $\delta_\tau^2 u$ can be neglected beside $\delta_\tau u$, then the equation reduces to

$$1 + \delta_\tau u = \frac{x}{m} \text{ and this to } 1 + \tau \frac{du}{dt} = \frac{x}{m};$$

\therefore , differentiating,

$$\tau \frac{d^2 u}{dt^2} = \frac{1}{m} \frac{dr}{dt} = \frac{a - z}{m} \text{ by (2)} = \frac{a(1 - e^u)}{m} \text{ by (3).}$$

Hence, since we have put s for $\frac{m}{a}$, the equation of the epidemic curve under the conditions stated is,

$$\frac{d^2 u}{dt^2} = \frac{1 - e^u}{s\tau} \quad . \quad . \quad . \quad . \quad . \quad (5)$$

If the oscillations of z from its level value a are small, then u is small and the equation becomes

$$\frac{d^2 u}{dt^2} + \frac{u}{s\tau} = 0 \quad . \quad . \quad . \quad . \quad . \quad (6)$$

Thus small epidemics under the conditions assumed are cyclic and

$$\text{period} = 2\pi\sqrt{s\tau} \quad . \quad . \quad . \quad . \quad . \quad (7)$$

If $\sqrt{s\tau}$ is taken as unit of time, equation (5) assumes its simplest form,

$$\frac{d^2u}{dt^2} = 1 - e^u \quad . \quad . \quad . \quad . \quad . \quad (8)$$

and the period of small oscillations is 2π .

If, as already done, we choose the incubation interval τ as our unit of time, the equation is,

$$\frac{d^2u}{dt^2} = \frac{1}{s}(1 - e^u) \quad . \quad . \quad . \quad . \quad . \quad (9)$$

and small oscillations have period measured as $2\pi\sqrt{s}$.

For small epidemic oscillations, then, we should have

$s =$	20	30	40	50	intervals,
Period = $2\pi\sqrt{s} =$	28.1	34.4	39.8	44.4	intervals.

Hence we find that fourfold epidemics increase the period,

$$+13.5, +13.7, +13.6, +13.3 \text{ per cent.},$$

and, pending further investigation, may, perhaps, expect that each addition of inflow number a to height of peak will add $4\frac{1}{2}$ per cent. to the period. The result may be stated :

In an epidemic in which attack follows attack at incubation interval τ and cases next interval are to cases last interval as susceptibles at mid instant are to steady state susceptibles, if adt are the steady accessions and m is the steady state number of susceptibles, when one infects one, an initial disturbance from the steady state is followed by oscillations, which are perpetuated. The period of a small oscillation is,

$$2\pi\sqrt{s\tau}, (s = m/a), \quad . \quad . \quad . \quad . \quad . \quad (10)$$

that is, 2π times the geometric mean of the incubation and repletion intervals, and period lengthens with amplitude of peaks and is about $13\frac{1}{2}$ per cent. longer when the peak cases outnumber the accessions fourfold.

A few features of the curves obtained on the above simple assumptions may be noted, some already pointed out and explained by Hamer for this class of epidemic eventuation.

The cases curve follows behind the susceptibles curve, and cases are peak and bottom when susceptibles are level coming down and level going up. For small oscillations the lag is quarter period. For small and large oscillations the susceptibles are peak when the

cases cross the accessions level going up and are bottom when the cases cross the same level coming down.

The susceptibles rise slow and fall quick unless, of course, the oscillations are minute. When the peaks are immense, that is, the epidemic is explosive, there follows a long intermission, when cases remain few; and the susceptibles rise uniformly, at the rate of the accessions, during this stage. Later on, during the next explosive peak they fall extremely rapidly. The curve of susceptibles in the limit is saw-shaped as in Fig. 4. Whilst the susceptibles are rising at a uniform rate the curve of cases is $\frac{z_t}{z_{-t}} = \frac{m + at}{m}$, and is therefore shaped like the inverse of a *poisson* and as shown in Fig. 5.

§ 2. *The Point Infection Curve modified by Seasonal Change in Infectivity. Analysis of a Glasgow Composite Measles Curve. Synthetic Curves of Epidemic Measles.*

The Glasgow curve of measles cases 1888-1927 examined for the purposes of this inquiry did not show anywhere the simple form of a single repeated wave, and Glasgow appears to be rather different from London (Hamer's composite curve) in the course taken by its measles epidemics. The nearest approach to a repetition of a curve was found in the six consecutive biennia '01-'12, and these biennia were, in the first analysis, compounded, and the result is shown in Fig. 6. This curve was integrated for area below the mean to get the curve of susceptibles, which is also drawn in and scaled from an origin to be explained.

It appears that in Glasgow the simple law that gives a single undulation at some period of recurrence cannot be postulated. The curves of cases at this epoch show, sensibly, the two-yearly repetition assumed in superposing, but show a large winter peak and small summer forepeak. It would be easy to suppose a two-year cycle in infecting agencies to account for the two-yearly effects, but this would be a little unhappy. Can we get the biennial phenomenon by applying the point infection law and merely presupposing an *annual*, that is, *seasonal*, change in perturbing influences, such as might be brought about by school break-up and reassembling, or other annual recurrences?

This was attempted as follows. Hamer, assuming a like law of infectivity, but with no seasonal coefficient, and assuming a fortnight the incubation interval, deduces from his composite curve a level number of susceptibles equivalent to 70 weeks' accumulation of inflow. The present endeavour, to arrive at a suitable season factor, was made antecedently to that connecting number of sus-

ceptibles with period, and it was assumed that Hamer's finding for London, in this matter, would sufficiently serve the purpose. Since Glasgow's inflow, as given by mean cases, was 208 per week during these six biennia, or 1,250 for the composite curve, the level number of susceptibles, when cases are peak (at the commencement of the year) was taken as $1,250 \times 70 = 87,500$, and the curve of susceptibles scaled from an origin to give this figure.

The data give cases per month, and if i is the incubation interval in months and k_θ the factor representing influence of season θ , the epidemic curve will take the form

$$\left(\frac{z_1}{z_{-1}}\right)^i = k_\theta \frac{x}{m} \quad . \quad . \quad . \quad (11)$$

or
$$i\delta \log z = \log k_\theta + \log x - \log m.$$

Plotting $\delta \log z$ against $\log x$ and joining the points having the same season and having regard to the errors that "cases" are subject to in the deep trough in the second year of the pair, the value of $i = \frac{1}{2}$ appeared to be justified, and the errors from the line $i\delta \log z = \log x - \log m$ appeared to call for a factor of the form,

$$k_\theta = 1 + \frac{1}{16} \cos \theta - \frac{1}{16} \cos 2\theta \quad . \quad . \quad . \quad (12)$$

The season factor k_θ , plotted in Fig. 7, argues a great reduction in infection carrying power in the summer and a smaller reduction in the winter, the latter being 10 per cent. below and the former 28 per cent. below the values at spring and autumn maxima. It thus roughly represents changes of concentration, such as are brought about by school and holidays, that are generally held to be answerable in some measure for the changes in infectivity.

It will be of interest to make an experiment to see how far this rounded form of season factor pulling with the susceptibles factor will modify the shape of the curve and the periods between peaks.

In order, at first, to avoid the possible effects of resonance, the factor was applied to a community, for which $s = 40$, and the natural period of peaks therefore in the neighbourhood of 45 fortnights, or 90 weeks, and not too near two years or 104 weeks for which resonance effects might be expected. The curve traced is therefore (fortnight units),

$$\frac{z_1}{z_{-1}} = (1 + \frac{1}{16} \cos \theta - \frac{1}{16} \cos 2\theta) \frac{x}{40a} \quad . \quad . \quad (13)$$

and a was taken = 1,000 susceptibles added per fortnight, so that the number of susceptibles when one infects one at season $\theta = 0$ is 40,000. A start was made at the beginning of the year with a two-fold strength of epidemic peak in the last fortnight of the old year

and the first fortnight of the new year, and therefore an accumulation of the level number of 40,000 susceptibles to begin the year, and the numerical computations of numbers of susceptibles and numbers of cases were machine calculated alternately to unfold the course of the epidemic for ten years.*

The graph is drawn out in Fig. 9, and the following points may be noted :

- (i) The peaks still show but are often double.
- (ii) The period of 45 fortnights, expected when no seasonal change in infectivity is introduced, is still discernible. The arrows drawn point to peaks or mean peaks.
- (iii) No resonance effect is discernible up to the point taken, and peaks (and troughs therefore) are of about the same content at the end as at the beginning of the ten-year period.
- (iv) The curve does not repeat, but is likely to do so, or very nearly repeat, in time.
- (v) The curve very nearly reached "steady-state" conditions at the end of the fourth year, with cases nearly a thousand and susceptibles nearly 40,000, yet the season stimulus sent the cases up two-and-a-half-fold in little over a year.

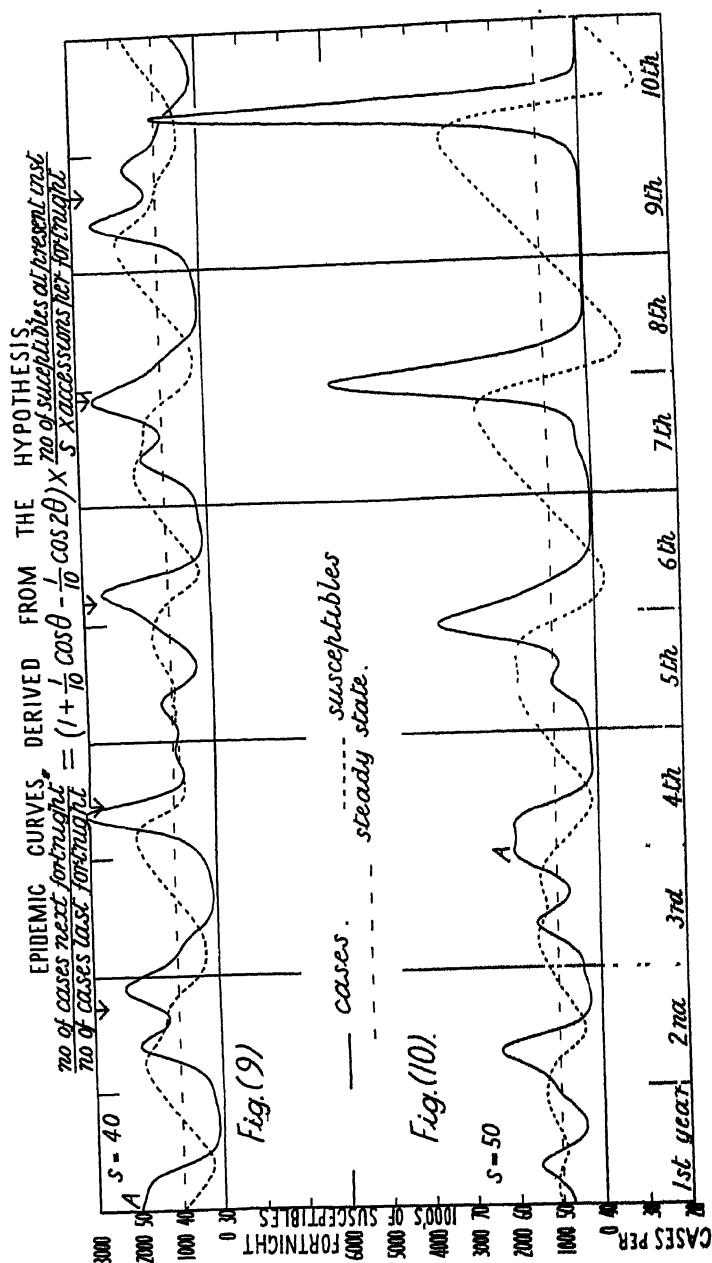
It appears to follow, then, that if a period can be seen with some security in any series of epidemic curves of the character of measles, this, in spite of seasonal disturbance, should yield an approximation to s and the level number of susceptibles.

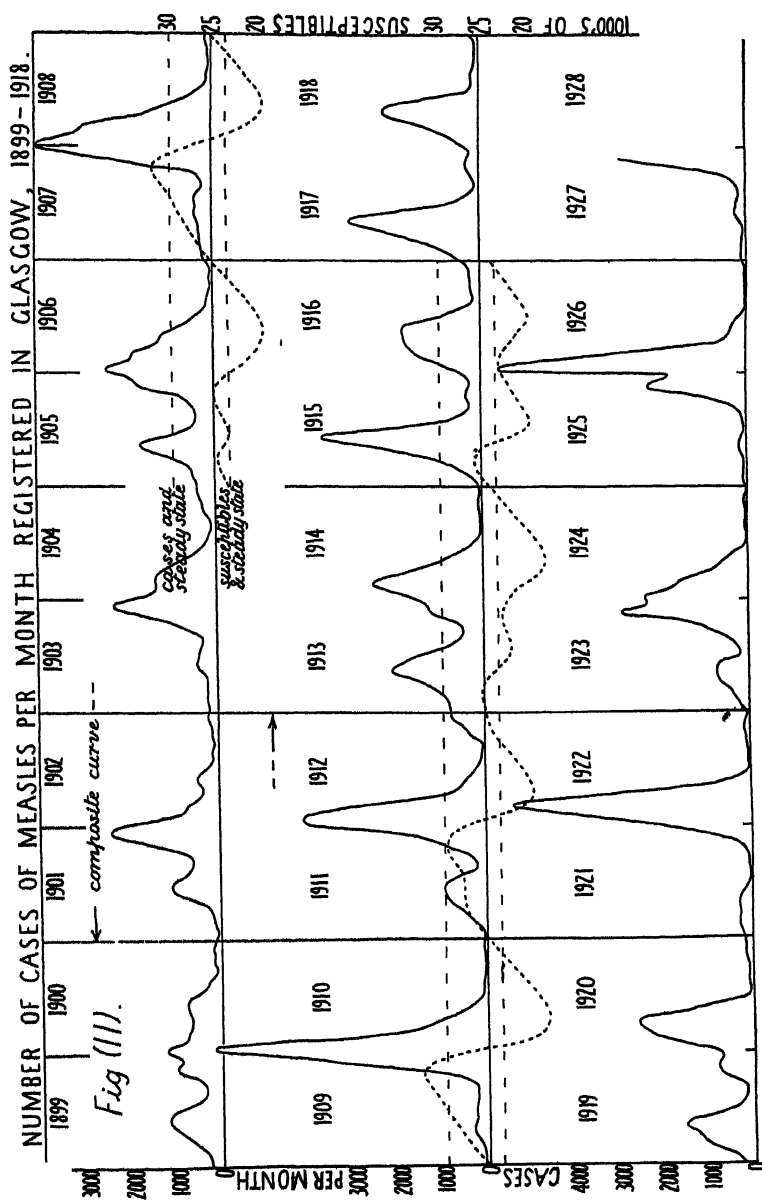
If, for instance, an 87-week period is discerned, as assuredly found by Brownlee for a part of London, an easy interpolation shows that the same recurrence period will be given as the result of supposing a point infection epidemic development, and a community so constructed in its inter-communications that one will infect one when the charge of susceptibles is equal to about 74 weeks' inflow of susceptibles.

The experiment seems to justify a new assessment of the number of susceptibles for Glasgow, previously conjectured at 70 weeks' accumulation, and this is next done, using the information thought to be afforded by considerations of periods. The rough fitted season factor is not changed and an attempt is made to reproduce the Glasgow type of curves, using this factor found from the compound curve and applying it to a bettered valuation of s , found from periods.

Now the period appears to be short of two years, but so nearly two years that, for the experiment, we take $s = 50$, which we should

* The commencement of this computation is shown in the Appendix.





expect to produce fourfold peaks succeeding one another at intermissions of 50.3 incubation intervals, taken as fortnights, or 100.6 weeks, which may very well represent the facts as to period more nearly than 104 weeks. For this epidemic series, then, are step by step calculated (fortnight units),

$$\frac{z_1}{z_{-1}} = (1 + \frac{1}{10} \cos \theta - \frac{1}{10} \cos 2\theta) 50a^x \quad \dots \quad (11)$$

and, as before, a start is made with a twofold peak, so that the calculations commence, as before, with

$$\theta = 0, z_{-1} = 2,000, z_1 = 2,000,$$

but in this instance $x = 50,000$ in place of 40,000.

The development is shown in the graph Fig. 10, *A* being the start, and the course of the epidemic was traced for nine years* forward and was retraced for three years backward, the numerical calculations for tracing the past being merely the reverse of those for unfolding the future. From this curve the following observations are suggested:—

(i) Starting the fourth year at a twofold peak, the fifth and sixth years very nearly reproduce the composite picture of the Glasgow epidemics '01-'12, and in particular the years '01-'02, '11 '12 (see Fig. 11). The seventh and eighth years reproduce Glasgow's great peak of '09-'10 and the diminishing forepeak. Thereafter Glasgow actually falls a little, but the fabricated curve continues to rise, and at the twelfth and thirteenth years has soared 13-fold, due to "resonance."

(ii) The first period from *A* is 101 weeks. The next is 106 weeks, the next 121 weeks, and the last is 133 weeks, so that these are much as to be expected between peaks of heights 2, 3½, 6, 10, and 13-fold the steady state numbers of cases.† The precise periods are a little risky.

(iii) Continuing back from *A* the epidemic becomes more level. The forepeak has beginnings that might with the main peak be held to form an *annual* epidemic progression, later on to move up to and subside down into the main peak. The annual early summer peak is evidenced many times in the Glasgow curves prior to and subsequent to the forepeak phase '01-'12 used for compounding.

(iv) There is not sufficient evidence to prove that the theoretical

* The graph here given omits the last two years.

† For small oscillations we expect period $2\pi\sqrt{50} = 44\frac{1}{2}$ fortns = 89 weeks. For 2-fold epidemics we expect period (add 4½% = 4) = 93 weeks. For 2-, 3-, 4-, 5-, 6-, 7-, 8-, 9-, 10-, 11-, 12-, 13-fold epidemics we expect

93, 97, 101, 105, 109, 113, 117, 121, 125, 129, 133, 137-week periods (15)

epidemics will go on soaring, but probably they will. When the cases are at bottom level the numbers have gone down to half a child a fortnight, and although decimalizing enables the theoretical curve to go on, practically any law has ceased to operate. This must happen in some measure also after every large epidemic. The cases reach a low level, when propagation depends upon a few occurrences, and on the events of these will, when the susceptibles have accumulated, depend the future course and whether the almost geometric progression will be a few intervals in advance or a few intervals behind their time.

In this section, then, from a composite curve of Glasgow measles a roughly approximating season factor of infectivity has been deduced formed of two Fourier terms, and this forced oscillation has been supposed to work with the natural oscillations to discover what kind of changes are made in the epidemic course as developed arithmetically from the formula.

In the next section, instead of compounding epidemic curves, which is clearly a risky proceeding where unreplicative detail is to seek, I have taken twelve individual consecutive years, choosing the years '05-'16 in place of '01-'12, as giving steadier biennial "case" figures (on which the inflow of susceptibles is based) at the expense of unreplicative shape of curve, which is now immaterial, and tried from these limited data to get answers to the questions, whether a month, fortnight, or week is better taken as the infection interval and, when a fortnight is shown to be a little the better of the three (when no season factor is assumed), whether the steady state number of susceptibles can again be taken as approximately 50 fortnights' inflow, as suggested by the period investigation, and, when this appears to be justified, whether a better season factor than the cosine formula can be found; and lastly, when the factor is chosen, what are its month by month errors and what statistical value can be put upon the formula used for prediction. The result is not very telling and seems to argue conditions in operation not taken account of in the simple theory.

§ 3. *Analysis of a Sequence of Years. Prediction.*

The figures * of the Glasgow monthly measles cases 1888-1927 are plotted on the chart Fig. 11,† and the curves seem to warrant

* The figures for '88-'16 were obtained from fortnightly figures supplied some time back to the late Dr. Brownlee. The figures for '17- were obtained by readings of the chart given on p. 100, Glasgow M.O.H. Report, 1926, and by interpolation of the calendar month figures in the subsequent Reports.

† Only years 1890-1927 are reproduced. 1918 in heading should read 1927.

the division of the whole period of 40 years into an initial five "even-odd" biennia showing peaks (where existing) near the middle of the space, an interjected peak year (1898) and a subsequent fifteen "odd-even" biennia (the last one, '27-'28, incomplete) having similar characteristics of inwardly disposed peakiness.

In order to estimate in some measure the varying inflow of susceptible persons, taken here to mean those who are going to be registered as contracting the disease, the actual numbers of measles cases annually and in the above biennial groupings are set out as follows:—

Cases of Measles registered in Glasgow.

1888	3,127	} 10,019	1901	10,719	} 16,289	1915	13,593	} 24,708
89	6,892		02	5,570		16	11,115	
90	4,837	} 8,225	03	8,768	} 17,175	17	12,670	} 21,190
91	3,388		04	8,407		18	8,520	
92	6,864	} 14,699	05	12,445	} 22,642	19	9,210	} 20,700
93	7,835		06	10,197		20	11,490	
94	4,890	} 10,470	07	9,821	} 24,443	21	4,030	} 21,810
95	5,580		08	14,622		22	17,780	
96	9,022	} 17,152	09	10,088	} 24,600	23	11,330	} 18,520
97	8,130		10	14,512		24	7,190	
98	9,623		11	9,503	} 24,310	25	6,830	} 22,580
			12	14,807		26	15,750	
99	9,186	} 15,922	13	14,745	} 25,078	27	8,980	}
1900	6,736		14	10,333		28	—	

Since measles is a disease of early childhood, the great changes in the figures of cases, which appear to double in 40 years, preclude the supposition of an even inflow of susceptibles throughout the period. In place of attempting to estimate the changes of inflow from the changes in cases, a part period was taken, namely, that from '05 to '16, comprising six biennia in which the registered cases were fairly equal and at the average rate of 12,148 per annum. Moreover, an examination of the ends of the '01 and '16 curves give assurance that the initial and final conditions of the period are much alike as regards the numbers of susceptibles in the community; for the cases were minimum about $4\frac{1}{2}$ months prior to each end, and the excess of susceptibles will be the subsequent accumulation, which must be about the same in both instances, since the cases are about the same.

We take then for detail analysis the twelve years' experience '05-'16 and take as the accessions of susceptible subjects to measles, male and female, the steady figure of 234 per week, or 468 per fortnight, or 936 per four-week month making a figure of 12,168 per annum, a trifle in excess of the average of registered cases of no consequence.

If it is desired to compare this figure with the births in Glasgow, these have been comparatively steady from '98 to '27, averaging

25,500 per annum, so that less than one-half of the births will come into our counts although the period was a heavy one in measles. Since it is a wide experience that some 90 per cent. of children reaching the age of 10 years have already had measles, there is clearly a serious discrepancy between "cases" and "registered cases," and it is not possible to say to what extent the existence of a large number of unregistered cases will invalidate any analysis based upon registered cases.

The number of susceptibles, then, according to our supposition, will increase by 936, the inflow, in any month and diminish by the number of cases. It will be known throughout when the commencing number is known. Since one purpose of the investigation is to find this number, we will only estimate it so that the integrals may be tabulated with least requirement of zero adjustment.

The curves seem to call a period of a little under two years, and, if a fortnight is the infection interval, this period would, by what has gone before, be given by supposing the steady state number of susceptibles equal to 50 fortnights' accessions. This number is 23,400 and, making allowances for the stage of the epidemic process reached, the initial number of susceptibles was reckoned at 23,500. Calling x' the numbers based on this commencing number, the adjusted numbers of susceptibles will be,

$$x = x' + A$$

where x' is observed and A is to be found.

The problem proposed is now to be stated thus. If, as before written, z_k is the number of cases next month and z_{-1} is the number of cases last month, and x is the present number of susceptibles, and if m is the steady state number of susceptibles and k_0 a seasonal disturbing factor, and if i is the transmission interval in months from infected to infecting, to find A , m , k_0 and i so that the data for the 12 years taken are best fitted by the formula,

$$\left(\frac{z_k}{z_{-1}}\right)^i = k_0 \frac{x' + A}{m} \quad . \quad . \quad . \quad . \quad (16)$$

As a practicable way of approach i was given the values $\frac{1}{2}$ and $\frac{1}{4}$ and the left side calculated by slide rule and Barlow's tables for each month succession and the best fit linear relation with x' found, k_0 being put unity, that is, season ignored. When i was selected k_0 was found to best correct the errors of each season. The procedure is plainly makeshift.*

* If i is found $= \frac{1}{2}$ and we call $\left(\frac{z_k}{z_{-1}}\right)^{\frac{1}{2}} = v$, the "infectivity," then to form the best relation $v = h(x' + A)$, where h is a constant for each season, θ , we should rightly make sum $\{v - h(x' + A)\}^2$ min., or sum θ sum $\{v - h\theta(x' + A)\}^2$

The results and their interpretations are as follows, and one of the three correlation tables, that for Case (ii), is shown.

(i) $i = 1$.

That is, if we take a month to be the step in the infection process, the steady-state number of susceptibles is . . . 10,277 - 936 \times 11 and represents 11 months' accumulation of inflow . . . (0.85 yr.) and we expect sm. epidemics in pds. of $2\pi\sqrt{11}$ or 21 mths. (1.60 yrs.) and large 4-fold epidemics to have periods $13\frac{1}{2}\%$ greater (1.82 yrs.).

(ii) $i = \frac{1}{2}$.

Or, if we take a fortnight as the infection interval, the steady-state number of susceptibles is . . . 22,700 = $468 \times 48\frac{1}{2}$ and represents $48\frac{1}{2}$ fortnights' accumulation of inflow . . . (1.87 yrs.) and we expect sm. epidemics in pds. of $2\pi\sqrt{48\frac{1}{2}}$ or $43\frac{3}{4}$ fortnts. (1.68 yrs.) and large 4-fold epidemics to have periods $13\frac{1}{2}\%$ greater (1.91 yrs.).

Correlation of $(z_t/z_{t-1})^{\frac{1}{2}}$ with x' .

Values of x' in 1000's.

	17-	18-	19-	20-	21-	22-	23-	24-	25-	26-	27-	28-	29-	30-	31-	32-
$(\frac{z_t}{z_{t-1}})^{\frac{1}{2}}$							1									
.2																
.1																
.0																
.9																
.8								1							1	
.7									1							
.6									1							
.5										1						
.4						1	1									
.3					1	2	2	2	1							
.2					2	2	2	2	1	1						
.1				2	2	2	2	2	1	1	1					
.0																
.9			3	3												
.8		2	4	4	5											
.7	1	3	7	2	7											
.6	2	1	2	1												
.5		1	1	2												

(iii) $i = \frac{1}{4}$.

If, lastly, we take a week to represent the interval, the finding is that

the steady-state number of susceptibles is . . . 44,900 = 234×192 and represents 192 weeks' accumulation of inflow . . . (3.60 yrs.) and we expect sm. epidemics in pds. of $2\pi\sqrt{192}$ or 87 wks. (1.67 yrs.) and large 4-fold epidemics to have periods $13\frac{1}{2}\%$ greater (1.90 yrs.).

min. Hence, varying h_θ , for each θ : $(vx')_\theta + (v_\theta)A - h_\theta\{(x'^2)_\theta + 2(x'_\theta)A + (1)_\theta A^2\} = 0$, where $()_\theta$ sums for all observations, season θ ; and, varying A .

$$\text{sums}\{(v_\theta)h_\theta - (x'_\theta)h_\theta^2 - (1)_\theta h_\theta^2 A\} = 0$$

yielding, for 13 seasons, an equation of the 51st degree to find A .

The standard errors of the predictions,

next month's cases
last month's cases =, (i) $\frac{\text{susceps.}}{10,277}$, (ii) $\left(\frac{\text{susceps.}}{22,700}\right)^2$, (iii) $\left(\frac{\text{susceps.}}{44,900}\right)^4$,

will be about (i) 0.58, (ii) 0.47, (iii) 0.49, and thus no very firm answer is given to the question put to the data, What is the interval from passage to passage of the infection? The errors, ignoring the influence of season, are least for (ii) a fortnight, but are not much greater for (iii) a week, whilst both findings will give susceptibles in number such as to give periodic surges a little less than two years in separation, such as is observed.

Although (iii) argues a susceptible population of 3.7 years' accumulation, or life, and this might be thought to accord better with the observed ages of cases, which were found to have a mean of $4\frac{1}{2}$ years in the great '25-'26 Glasgow epidemic, whilst (ii) offers a susceptible life of 1.9 years only, yet other considerations, such as, for instance, a varying susceptibility in the young unaffected population, would have to be brought into consideration to fill out the already dismembered picture, and since a fortnight is the usually accepted interval, this interval will be taken, as best supported by the somewhat uncertain evidence here presented.*

We take then (ii), $i = \frac{1}{2}$, as the best formula (disregarding seasons) to represent the progressive features of the Glasgow '05-'16 epidemics of measles. The regression line gives not only the denominator, 22,700, but also the unknown constant to be added to all the tabulated numbers of susceptibles. This constant A is given as 120. Thus the steady-state number of susceptibles and the initial number, as given by the statistical regression, are both very near what had been reckoned by periods and phases, and in the next investigation relating to the values of the season constant k_θ , the previously reckoned constants were left unchanged.

The formula taken, then, is,

$$\frac{z_1}{z_{-1}} = k_{\theta} \frac{w}{23,400} \quad (23,400 = 50 \times \text{fortnight's inflow}),$$

with a commencing number of susceptibles equal to 23,500 and is calculated for each monthly sequence. It is clear that good agreement with a law cannot be expected when the cases number, say only 100 a month, and better values of k_θ will be evidenced when

* It is clear that, if the variations from steady conditions are small, one formula will be functionally derivable from another, and halving the interval will in effect be similar to doubling the susceptibles. If ξ is small, $\frac{z_{\frac{1}{2}}}{z_{-\frac{1}{2}}} = \frac{m + \xi}{m}$

is the same as $\left(\frac{z_{\frac{1}{2}}}{z_{-\frac{1}{2}}}\right)^2 = \frac{2m + \xi}{2m}$

the cases number over 1,000. The table below gives the calculated values, and against each is put a number, the number (1) indicating that the lesser of the monthly cases ratioed is between 44 and 100, (2) between 101 and 500, (3) between 501 and 1,000, (4) that both exceed 1,000. Season 0 is the commencement of the year and is cyclically the same as season 13.

The means are those of the values numbered (2), (3) and (4), *i.e.* neglecting (1), and the third mean is adjusted from 1.087 and the fourth from 1.052, the remainder being nearest figures.

The curve of seasonal coefficient of infectivity so given is shown in Fig. 8, but it must be admitted that the actual ratios diverge at times very much from this mean curve. The curve as it stands differs from the symmetrical sine curve previously fitted in having an enhanced autumn peak at $0 = 10$, followed by a gradual descent instead of by a dip and rise. To put a statistical value upon the result, as a portrayal of what has actually happened in the twelve years that have been analysed for fitting the law taken, we may examine the values of $\left(\frac{z_1}{z_{-1}}\right)^{\frac{1}{2}}$, which measures to some approximation

the numbers infected a fortnight hence by each present case, at the several dates, or the "manifest" infectivity. These figures, already calculated and shown in the correlation table, range round about 1, and, taking the 126 monthly experiences, namely, the 12×13 156 total less 30 marked (1), and rejected because one of the two months reported less than 100 cases, the mean divergence from 1 is 0.211. The mean error of a forecast of precise unity for the present infectivity is thus 21 per cent. If, on the other hand, we estimate as done and allow for the changing numbers of susceptibles and allow for the season factor, whose mean is 1.02, the figures for the errors in this, by the foregoing table, will have mean 0.107 or 10.5 per cent. It appears then that the application of the process may be expected to remove one-half of the error assumed in merely predicting the infectivity at its steady-state value of unity, that is, in predicting next fortnight's cases equal to last fortnight's cases.

In effect, then, the result is much the same as saying that infectivity has correlation $\sqrt{1 - (\frac{1}{3})^2} = 0.87$ with susceptibles and season, as formulated.

The law of propagation of the disease of measles, as disclosed in the twelve years' data from Glasgow, is therefore not quite so simple that we can get good forecasts merely by premising a uniform inflow of susceptibles, who will all take the disease, and an infectivity depending on the accumulation of such susceptibles and on a season

Values of k_0 .

Season	0	1	2	3	4	5	6	7	8	9	10	11	12
'05	1.04 (2)	1.04 (2)	1.10 (3)	1.25 (3)	1.14 (4)	0.87 (4)	0.72 (3)	0.79 (2)	0.99 (2)	1.10 (2)	1.16 (3)	1.29 (3)	1.03 (4)
'06	1.11 (4)	0.96 (4)	1.10 (4)	0.97 (4)	1.15 (4)	0.94 (3)	0.94 (3)	0.77 (2)	0.94 (2)	0.78 (1)	0.99 (1)	1.07 (1)	0.96 (1)
'07	1.05 (1)	0.93 (2)	0.93 (2)	0.89 (2)	0.87 (2)	0.91 (2)	0.79 (2)	0.78 (2)	0.57 (2)	0.90 (2)	1.34 (2)	1.07 (3)	0.96 (4)
'08	0.99 (4)	0.86 (4)	1.00 (4)	1.02 (4)	0.98 (4)	0.93 (3)	0.85 (2)	0.68 (2)	1.03 (2)	0.84 (1)	1.39 (1)	1.09 (1)	1.25 (1)
'09	0.74 (1)	0.96 (1)	1.12 (1)	1.14 (2)	0.88 (2)	0.74 (2)	0.82 (2)	0.72 (2)	0.76 (2)	0.79 (2)	1.27 (2)	1.23 (3)	1.02 (4)
'10	1.01 (4)	0.85 (4)	0.83 (4)	1.03 (4)	0.99 (3)	0.92 (2)	0.76 (2)	1.06 (1)	0.98 (1)	0.84 (1)	1.08 (1)	1.23 (1)	1.16 (1)
'11	0.72 (1)	1.54 (1)	1.33 (2)	1.08 (2)	1.03 (3)	0.84 (3)	0.84 (3)	0.65 (3)	0.51 (2)	1.03 (2)	1.31 (2)	1.01 (3)	1.12 (4)
'12	1.09 (4)	0.94 (4)	0.90 (4)	0.78 (4)	0.86 (3)	1.00 (2)	0.84 (2)	0.78 (2)	0.86 (1)	0.98 (1)	2.25 (1)	1.21 (2)	1.15 (3)
'13	0.93 (3)	0.99 (3)	1.05 (3)	1.08 (3)	1.14 (4)	0.97 (4)	0.94 (4)	0.83 (3)	0.84 (3)	0.96 (2)	1.25 (3)	1.36 (3)	1.43 (4)
'14	1.24 (4)	1.28 (4)	1.15 (4)	1.04 (4)	1.05 (4)	0.98 (3)	0.82 (2)	0.67 (1)	1.14 (1)	0.98 (1)	1.44 (1)	1.12 (1)	0.79 (1)
'15	1.30 (1)	1.72 (2)	1.36 (2)	1.24 (3)	1.23 (4)	1.19 (4)	0.92 (4)	0.68 (3)	0.84 (2)	0.96 (2)	1.30 (2)	0.97 (2)	1.14 (2)
'16	1.49 (2)	1.32 (3)	1.21 (4)	1.11 (4)	1.11 (4)	1.14 (4)	0.88 (3)	0.82 (2)	0.69 (2)	1.25 (2)	1.09 (2)	1.07 (2)	1.19 (2)
Means .	1.11	1.09	1.08	1.07	1.04	0.96	0.84	0.75	0.80	1.00	1.25	1.15	1.13

factor. This may be said to give half the picture * in a selected period. Beyond the period taken the biennial cases are subject to great changes, in that a quarter instead of a half of the births may become registered cases, and a further difficulty will therefore be met, here, in prescribing what are to be laid down as the larger movements in "births" and level "populations" of supposed susceptible persons upon which the epidemic upheavals are raised. Indeed, the difficulty, perhaps, has been evaded only in the period chosen, and an even biennial inflow of registered cases cannot be held to justify the assumption of an even inflow of susceptible persons who will become registered cases.

In many other respects the model must be liable to wide differences from the actual phenomenon, and the observed discord between formula and event may be thought as due to many possible reasons above and beyond that already commented upon, the want of parity between actual and registered cases.

Most cogent of these is, perhaps, a false analogy between infection in disease and the mechanism understood under the name of chemical mass-action which is premised when the cases at any instant are put equal to the cases one infection interval back multiplied by the number of susceptibles and some constant. Apart from the great differences in the statistical numbers dealt with in the two fields, in a liquid the intimate uniformity of the mixture and the conditions of intermingling and collision are likely to be more law-abiding than are the similar traits in a community of persons. After all, the contacts are comparatively few and are subject to volition as well as to chance, and, in addition, a single community may be quite differently constituted in respect to its seclusion or minglings in one part and another. The school long recess and reopenings will be a common feature, and this change in concentration seems to be reflected in the great dip in the curve of the seasonal factor k in the seventh month and rise in the tenth month, of the thirteen months. But even if a general factor can be accepted to take care of the degrees of mingling in the several seasons, and whatever influences may be attributable to temperature and weather, and if, in each section of the community having intercourse, something approaching the mass action law of infection is followed, yet it is still questionable how far the different curves with their different phases and, perhaps, different periods will unite into a single curve

* Of course the prediction, next fortnight's cases/last fortnight's cases 1 is a great advance upon the prediction of the crude statistical mean of cases. It is the errors in $\left(\frac{z_1}{z_{-1}}\right)^{\frac{1}{2}} = 1$ that have been halved in $\left(\frac{z_1}{z_{-1}}\right)^{\frac{1}{2}} = -k\theta^x_m, i.e.$ in allowing for season factor and estimate of susceptibles.

having the same characteristics, and perhaps it is the imperfect mixture and the imperfect tuning of the parts that are responsible for the apparent discord in the whole.

In another respect the outline is drawn free-hand, for susceptibility cannot be thought of as a unitary character, but certainly varies with age and probably with constitution and with occasion. Under these conditions a "number of susceptibles" can only be a mathematical figment to represent the result of such a division of the community into naughts and ones as will nearest reproduce the effect observed under the law pronounced. Here, then, may lurk another source of error. It may, perhaps, not be true that the numbers counted as "having taken the disease" is the correct depletion from this fictitious number of "susceptibles" that governs the count of attacks.

The examination has been confined to a series of measles epidemics where the kind of process premised is already known to be operative, and it might be asked whether *any* disease of variable prevalence could not be analysed in the same way to show "exhaustion" and "replenishment" of susceptibles, should contagion and immunisation of susceptibles exist in fact or not. The process is a physical one and is very similar to that governing the alternations of two forms of energy seen in many periodic phenomena, as, for instance, in the swing of the pendulum, where, in fact, our equation would be $\frac{d^2\theta}{dt^2} = -\sin \theta$ in place of $\frac{d^2u}{dt^2} = 1 - e^u$. The argument for the alternation of states rests upon the fit of the facts to the physical law proposed, and chief of the facts must be periodicity. If in an epidemic curve periodicity can be discerned through such disturbing influences as forced seasonal impulses and the lawlessness of small numbers, then the pendulum action can be argued, and the phenomenon admits interpretation in rough analogy as the exchange of the potential energy of susceptibles for the kinetic energy of cases (in their departures from steady-state values). If the oscillations are large, additional argument can be adduced by bringing to bear a more minute analysis and the law can be better defined and additional constants inferred. Naturally the oscillations could be supposed produced in other ways, and the logic only says that they might or might not reasonably be supposed to be produced in the manner put forward.

An instance in point will be the chart of weekly cases of diphtheria in London 1914 to 1927 shown in Fig. 12. There is clearly a seasonal impulse and cases are more numerous in the fourth quarter of the year. But, apart from this (which is a forced oscillation) no pendulum effect is in clear evidence. The epidemic was at a steady level

during the war years, and the season factor was not able to create oscillations of increasing magnitude. Upon this steady state was impressed in the winter of 1919 a great impulse and cases were high, that is, the pendulum was swinging fast, say to right, during '20, '21, '22 and until the summer of '23. Had there been, as a consequence of this increase in cases for $3\frac{1}{2}$ years, a reduction in the normal number of susceptibles and had the disease been of the kind in large measure propagated by case to case infection, then we should expect the fast swing to right to be followed by a fast swing to left, during which cases were below their steady-state value. But the cases descend only to their former steady level and not perceptibly below it, and, moreover, there is no very evident swing-swing in the subsequent course as far as the data are available.

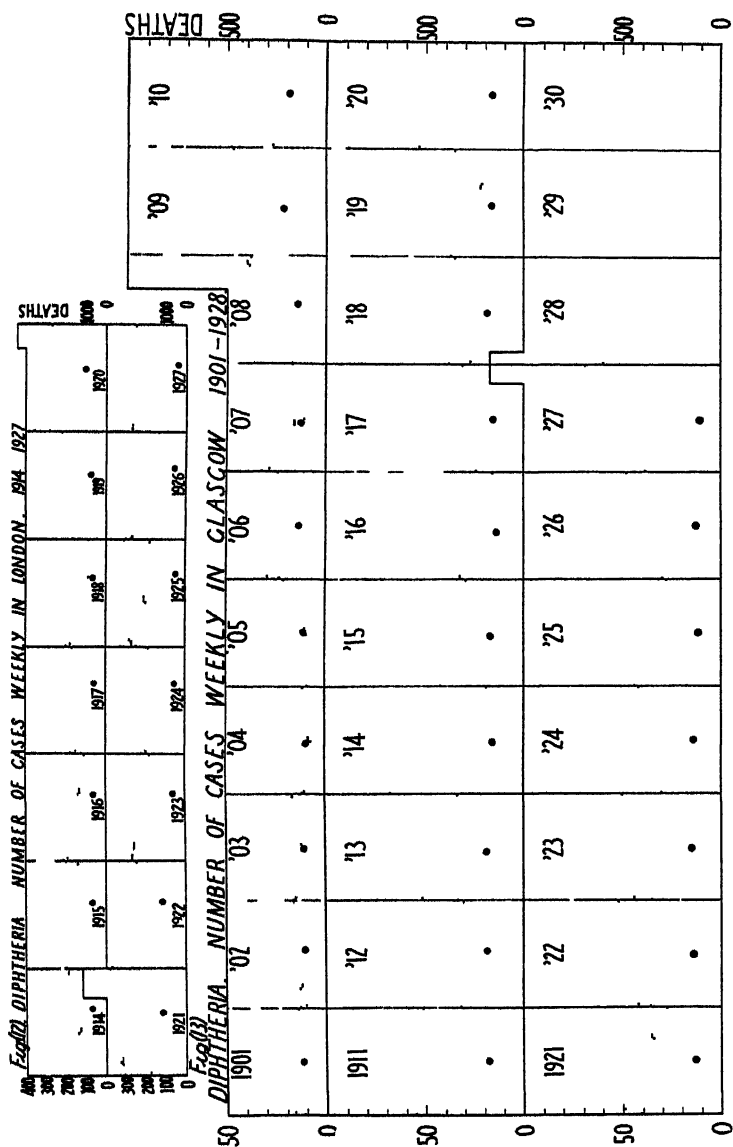
It does not appear then that such a chart as this could be subjected to any analysis that would show evidence of the existence of an underlying duality of phases taken up by the community alternately with a natural period of recurrence and which calls for a physical explanation.

The picture that would suffice for the London diphtheria series here presented is a mere multiplication of the annual phenomenon, in numbers, for a few years, followed by no reversal of the portrait. It does not follow, of course, that the action is not taking place, but that, if it does, either for other reasons or for the reason that London has too many pendulums and too loose a beam, the simple phenomenon cannot be disengaged.

A second instance is the like plot of diphtheria weekly cases in Glasgow for 1901-28 shown in Fig. 13.* Although a smaller city and, it might be thought, more self-contained, yet no more in Glasgow than in London do we find, at least upon eye evidence, the phenomenon of higher crest followed by deeper trough, necessary to justify the postulate of an exhaustion of susceptibles and deduce pendulum action. It may perhaps be, as some think, that diphtheria is propagated largely by subclinical cases, or carriers, and that, in the wider action, immunity is very imperfect, and, if this is so, then the equations must be reconstructed, and perhaps it would appear that a high degree of damping precludes the sustenance of waves.

In both the London and Glasgow data there is a great discrepancy between notified cases of diphtheria and deaths as shown for each year by the large dots. One expects a proportionality between cases and deaths if both are like occurrences in a like process following a natural course. The cases have advanced out of all proportionality, and in Glasgow, for instance, comparing 1927 with 1898, the cases are multiplied by 7 whilst the deaths are the same, viz. 113.

* From figures kindly supplied by the Medical Officer of Health, Glasgow.



Perhaps here may await further troubles for those who would digest the presented figures, this time a surfeit in place of a dearth of cases, and as part explanation the Medical Officer of Health (Glasgow Report, 1908, p. 64) states that "the practice which has been followed for some time of examining the throats of contacts in houses whenever a second case occurs, and the consequent registration of cases which by reason of their mildness would have escaped observation altogether but for the recovery of the organism of the disease, has undoubtedly tended to reduce the ratio of fatal attacks." Clearly, then, a "case" has changed its meaning and we cannot postulate a continuity of the readings of the instruments in this series representing the prevalence of diphtheria.

Although the course of epidemic measles in Glasgow during forty years is far from yielding obedience to the simple law of infection that is modelled on mass action in a perfect mixture, yet the overriding waves possess features similar to those shown proper to such an action, characterized, let us say, by delayed instant activation in a uniformly replenished motile mass. By study of these short-timed waves some representative constants can be found, susceptible of interpretation, and with help of these the epidemic process can to some extent be followed and foreshadowed.

I wish to acknowledge the invaluable help that I have received from Professor Greenwood in carrying out and presenting this investigation.

APPENDIX.

I. Number of cases per month (4 weeks) registered in Glasgow, 1901-16.

II. Calculation for ten years (26 fortnights) of synthetic epidemic,

$$\frac{\text{cases next fortnight}}{\text{cases last fortnight}} = (1 + \frac{1}{10} \cos 0 - \frac{1}{10} \cos 20) \times$$

no. of suscep. at present instant
40 × accessions per fortnight

III. Conditions leading to damped oscillations (and example worked out).

III.—*Hypothesis of diminishing Infective Power. Damped Oscillations.*

In the foregoing theory, intended to be a first approximation to the transmission of a disease such as measles, infecting power was supposed to be instant, at the termination of a certain incubation period, and it appears that, with such a law in operation, an initial upset of steady conditions of prevalence will be followed by epidemic

waves that propagate themselves indefinitely, without diminution of amplitude.

To illustrate how a modification of the "instant" hypothesis may affect the result and, in this case, introduce a damping down of the oscillations, let us make the supposition that infecting power is possessed immediately infection is taken and is exercised without loss until the moment of recovery and passage out of the statistics. Let us also suppose that this may happen with equal chance $\frac{dt}{\tau}$ at any instant, so that τ is the mean "life" in the infecting condition; then if y stand for the number of infected individuals at any moment, $y \frac{dt}{\tau}$ is the depletion of y in time dt due to "recoveries." We may regard τ as the equivalent, here, of the incubation period, before, and shall put it = 2 weeks for the arithmetical example.

Let a , as before, stand for the accessions of susceptibles per unit of time. Then, in the steady-state, a is also the number of new cases, since we suppose no deaths amongst the x 's. In the steady state, therefore, $y = a\tau$. Let $x = as$ under the same circumstances, that is, let the steady-state susceptibles be the accumulation of accessions for time s (following our former connotation). Then at any moment the cases per unit time are $a \frac{x}{as} \frac{y}{a\tau}$. Hence the equations for developing the epidemic form are,

$$\left. \begin{aligned} \frac{dx}{dt} &= a - a \frac{x}{as} \frac{y}{a\tau} \\ \frac{dy}{dt} &= a \frac{x}{as} \frac{y}{a\tau} - a \frac{y}{a\tau} \end{aligned} \right\} \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad (i)$$

To obtain an arithmetical result the data found by Sir William Hamer for London measles were taken, viz. a = 2,200 susceptibles added per week, as = steady-state susceptibles = 150,000 ($\therefore s$ = 68.2 weeks), and putting τ = 2 weeks and finite differences for differential coefficients, the equations are,

$$\left. \begin{aligned} x_1 &= x + 2,200 - \frac{xy}{300,000} \\ y_1 &= y + \frac{xy}{300,000} - \frac{1}{2}y \end{aligned} \right\} \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad (ii)$$

The week by week numbers of susceptibles x and infected y and new cases $xy/300,000$ were calculated, commencing with a peak of 6,500 cases, or nearly threefold, and the curve of cases proved to be periodic, with period 77 weeks (very near the 78 weeks assumed by Hamer for compounding). The form of the curve was very similar to Fig. 3 found on the previous hypothesis, but now the peaks are

successively lowered and the second peak is only 5,168 cases, or 80 per cent. of the first.

Damping down of oscillations is therefore to be expected on the theory that infecting power, instead of being "instant" after an "interval" is prolonged from the time infection was taken for a "chance" space of time.

The values found for period and damping for this epidemic wave, commencing with a threefold peak, may be compared with values that can be computed for small oscillations.

If u, v are small fractional departures in x and y from their steady-state values, $as, a\tau$, then, putting $x/as = 1 + u, y/a\tau = 1 + v$ in (i) and neglecting products of u, v , the equations become,

$$\left. \begin{aligned} s \frac{du}{dt} &= -u - v \\ \tau \frac{dv}{dt} &= u \end{aligned} \right\},$$

$$\therefore \frac{d^2u}{dt^2} + \frac{1}{s} \frac{du}{dt} + \frac{1}{s\tau} u = 0,$$

with like equation for v . Hence, solving the quadratic,

$$u = \hat{u} e^{-\frac{t}{2s}} \cos \left\{ \sqrt{1 - \frac{\tau}{4s}} \frac{t}{s} \right\} \quad \text{(iii)}$$

Thus the period is now $\frac{2\pi\sqrt{s\tau}}{\sqrt{1 - \frac{\tau}{4s}}}$, and will be a trifle longer than

the period $2\pi\sqrt{s\tau}$ found for the "point" hypothesis, whilst damping has time-modulus $2s$.

Putting $\tau = 2$ weeks and $s = 68.2$ weeks, we get for small oscillations a period of 73.7 weeks and damping to the extent in one period of *exp.* $- 73.7/2 \times 68.2 = 0.58$.

It appears, then, that if this kind of infectivity is supposed to follow a case of measles, namely, if we suppose infective power maintained without loss for a term whose chance of end is dt/τ , or, what amounts to the same thing, if we suppose the power to suffer geometrical diminution with time in each attacked individual at rate dt/τ , then, if in the steady-state susceptibles are = accessions accumulated for time s , small oscillations have

$$\text{period} = \frac{2\pi\sqrt{s\tau}}{\sqrt{1 - \frac{\tau}{4s}}}; \text{ time modulus of damping} = 2s.$$

For the case, studied arithmetically, in which $\tau = 2, s = 68.2$ and first peak was threefold, the period was found 77 weeks in place of 73.7, calculated for small oscillations, and the second peak was found to be 0.80 of the first peak in place of 0.58 so calculated.

DISCUSSION ON MR. SOPER'S PAPER.

SIR WILLIAM HAMER: I am very glad to have an opportunity of thanking Mr. Soper for the far too generous terms in which he has referred to my London measles-curve of twenty-two years ago. It was just the outcome of realizing—as Professor Boycott told us the other day we ought to do—that “we must not be too shy of drawing general conclusions from such specially easy and demonstrative examples as Providence has provided for our learning and pushes under our noses”—and such an instance is unquestionably that which was singled out half a century ago by Ransome, and was later studied by Whitelegge, Campbell Munro and others, viz. the example presented by the insistent invariability of the measles organism coupled with the lasting protection afforded by one attack of the disease.

Professor Boycott, it is true, pointed out on the same occasion “the danger of cultivating thoughts and reading books to which we are not equal.” At the same time he did not entirely discountenance the “putting together of some sort of lay figure on which we can hang the facts which interest us and see how they fit,” and “of getting rid of some of our imaginings and sketching the *Jemima* on which they seem to look fairly presentable.” My poor little *Jemima* has grown beyond all recognition, if she be in any way related to the lady whose portrait Mr. Soper has unveiled for us this evening. The transformation he has effected can only be compared with that accomplished by Mr. Bernard Shaw's *Pygmalion*—the Professor of Phonetics—who fashioned the Covent Garden flower-girl, Eliza Doolittle, into one of the most peerless *Galateas* that ever stepped off a pedestal. Mr. Soper's analysis is extraordinarily interesting. He favours a point of infection law in measles, and so enlarges our sense of “the importance of *annual*, that is, *seasonal* change in perturbing epidemics, such as might be brought about by school break-ups and assembling, and other annual occurrences.” These influences were all very clearly discussed by Power and Shirley Murphy forty years ago. Again, Mr. Soper deplores the existence of evidence showing the number of unregistered cases in Glasgow, and here too London experience bears him out. German measles, moreover, is a great trouble when it becomes epidemic. And then, as Mr. Soper says, “a single community may be quite differently constituted in respect to its seclusion or mingling in one part or another.” Allowing for all this, the fact clearly emerges that Mr. Soper is *really* “blazing a trail,” and not merely peeping into the jungle, as I did twenty-two years ago, and just scuttling away on discerning the presence there of forbidding shapes in the form of theoretical measles waves. Realizing as I now do how fearsome these monsters are, I rejoice to find a much more intrepid, and withal fully equipped, explorer now describing his adventures in these practically unexplored, but most intriguing happy hunting grounds.

DR. ISSERLIS: I welcome the opportunity of congratulating the Society on this excellent paper that Mr. Soper has read this evening.

I had rather thought that Sir William Hamer would speak from his particular knowledge of the subject, and that as Mr. Soper has treated the subject from the point of view of mathematics, the pure mathematician would be asked to speak about the mathematical aspects of the case. I feel, however, that we have had sufficient mathematics to follow without the aid of pencil and paper, and I prefer to confine myself to making the general statement that it is in my opinion a very important thing to lay down a hypothesis—a simple hypothesis if you like, but a definite hypothesis—and to follow it out to its mathematical conclusions in this way; to confront the results of that hypothesis with the facts or the results of experiment. In treating the problem in this way, Sir William Hamer and Mr. Soper have followed a totally different trail from that followed by the late Dr. Brownlee, who followed the astronomers in their analysis of sun-spots in order to observe periods in them.

The result of Mr. Soper's analysis has been this:—He says that a simple hypothesis is, in the case of the observations to which he has applied it, sufficient to account rightly for about one-half of the observed phenomena, and that is a very great deal. The question now is, how soon will Mr. Soper undertake to clear up the remaining half of the phenomena? There was one paragraph in the paper that Mr. Soper did not read to us; that is, the paragraph in which he draws our attention to the fact that the underlying assumption of the whole mathematical analysis is the constancy of the quantity A , which is the number of oscillations per unit of time. That is obviously an important simple case, but it is more likely to be the state of affairs in a large town like London than in a smaller town like Glasgow, and still less likely to be the case in a small community like Beacontree, in which the immigration year after year of young persons results not exactly in an addition to the birth-rate, but in a steady increase in Mr. Soper's A ; and I dare say one could imagine a Welsh mining village under prevailing conditions, in which the steady emigration of young men and women would result in an increase of A .

I would throw out the suggestion that if Mr. Soper treated his A as, first, a slowly increasing function of the time, and, second, a slowly decreasing function of time—that is, combined with his hypothesis, a variable infectivity period—he might be able to clear up some part of the remaining phenomena.

Of course to ask Mr. Soper to do more is obviously at the same time to express one's satisfaction with what he has done.

I do not wish at this stage to enter into any discussion of the mathematical part of the theory, and I simply ask you to receive from me my expression of appreciation of Mr. Soper's paper.

DR. CROOKSHANK said that when asked by the Honorary Secretary to attend the meeting and to intervene in the discussion, he had replied by saying that he would only speak if he could do so intelligently, and he had hoped that, having said so much, he would have been protected! But Dr. Greenwood had told him a few minutes

before the meeting that he would be showing a lack of appreciation of the courtesy extended to him if he did not make *some* remarks, and that, in the circumstances, remarks he might make would be considered relevant that might not be so considered otherwise.

He had the profoundest admiration for the mathematical part of the paper; truly, he did not understand anything about it, and perhaps that was why he had such an admiration for it. But he had to confess to a profound distrust of statistical method on all occasions excepting when applied to the examination of a particular theory, or of particular data. As to the supposed value of the "numerical method" as a method of finding out "what really happens," he shared the constitutional antipathy of the late Professor Trousseau, who was as great a clinical physician as he himself was a very obscure one.

It was only from the point of view of the clinical physician or epidemiologist that he could say anything on the subject.

So far as Mr. Soper's paper was to be considered as an examination of the theory put forward by Sir William Hamer, Dr. Crookshank said that he must admit that for many years he had had a profound distrust of Sir William's views on this particular subject, though not on any other. So far as Mr. Soper's remarks were to be considered as elucidatory of the general theory of epidemiology, Dr. Crookshank distrusted his analysis. But there were several points in the paper about which he felt bound to speak because they hit him in weak spots and gave him occasion to bring out what friends called his "King Charles's head." At the bottom of page 35, Mr. Soper said: "We may suppose, again, that after acquisition the *disease* has *powers* of infecting others according to some law of intensity with lapse of time." That was the kind of phrase that, as a clinical physician, he strongly objected to, because he could not understand what people meant when they spoke about "a" *disease* which could be *acquired* and which itself *had powers* of infecting others. It seemed to him that this speaking about a disease as a separate entity with specific powers let us in for scholastic realism of the worst possible kind.

One important question, from the point of view of the clinical physician, was whether one should ever talk in this kind of way about the phenomena with which one had to deal, as if due to the actual acquisition or powers of some kind of entity. On the other hand, the tactical advantage of speaking in this way about a *disease* which had *powers* of this kind was that one did get out of a certain amount of awkwardness in controversy. Truly one might suppose that after acquisition of the *bacillus* the *bacillus* had powers of infecting other people, but it was not yet determined what the virus of measles was, and although it was assumed that measles could be dealt with as if it were a question of dealing with a bacillus, there was still an element of doubt. He could not help feeling that these mathematical analyses of the so-called phenomena of epidemic diseases were too often analyses of the particular views or notions of a particular person, rather than of *what actually did happen*, and

before one went much further in the way of mathematical analysis of epidemiological *statistics* there ought to be some better hypotheses than at present concerning epidemic disease and so forth, on which the mathematician should get to work on the lines indicated by Dr. Isserlis.

Dr. Crookshank said he deprecated mathematical discussion at the present stage so long as only those theories of Sir William Hamer were available. After all, Sir William Hamer had put forward his notions in 1906 and the author of the present paper spoke as if no other theories had been put forward since. He (Mr. Soper) had evidently forgotten the clear-cut and well-stated notions regarding epidemic disease—he referred here to work done by himself, Dr. Crookshank—of which no notice had ever been taken. It was because no notice had been taken that he began to feel there was something in them, and that they evidently did not afford matter for destructive criticism. Some of his original work on this subject was done in 1908, two years after Sir William Hamer's, and his own tentative "Jemima" was put forward at Sir William's own request and had been ignored by everybody ever since.

One of his difficulties was what was meant by the term "susceptible." Up to the present he had never heard any other meaning than what was implied when we say that susceptibles were the people who got the disease, and the non-susceptibles were those who did not get it. By this reasoning, certainly, the epidemic came to an end because the susceptibles were exhausted and only the non-susceptibles left.

As he had pointed out, Sir William Hamer's work was done over twenty years ago, and there did seem to have been a certain amount of work done on the subject since, and some attention should be paid to it. The writer who should be nameless had made an attempt to get round the difficulty, but instead of dividing the population into

A—susceptibles (people who took the disease),

B—non-susceptibles (people who did not take the disease),

he divided them into three classes :

A—susceptibles,

B—non-susceptibles,

C—an intermediate group—people who did not get the *disease* but who were transformed from susceptibles to non-susceptibles.

An interesting point about such a theory was that there were three categories instead of two, and it was much easier to indulge in a satisfactory *petitio principii* when one had three terms to juggle with instead of two.

To proceed a little further, supposing the question of susceptibility were examined mathematically, there were so many constants, and susceptibility was such an extraordinarily relative thing. One might be susceptible in the morning but not susceptible in the afternoon. One was susceptible if one went out to see a case in the

middle of the night on an empty stomach, but not susceptible if one saw a case after a meal, and Dr. Crookshank could not see how mathematicians were going to deal with that kind of variation.

There was another factor mentioned by someone—if not Professor Chadwick it should have been—that besides the seed and the soil, one had to deal with *occasion*. There seemed to be something intervening besides soil and seed before the thing “clicked.” Speaking as a worker in the field, he felt that that “occasion” business had to be recognized. Mr. Soper spoke about the discrepancy between registered and unregistered cases. Few people realized how great that was; it was colossal, and in saying so he was speaking with feeling, because of what he experienced years ago when he was occupying three positions at once—engaged in general practice, as a Medical Officer of Health, and as a Superintendent of an Isolation Hospital. (A curve should be constructed to show how rare such a thing was.) It meant that one had remarkable opportunities for observation, and he used to know that scarlet fever and measles were prevalent in the district long before his colleagues in practice started notifying them as such, so that the curves he constructed from the notified cases had no relation to the curves he could construct from his own observations.

On one occasion he saw two little children in one day who were suffering from a form of diarrhoea. That day one of his colleagues notified a case as one of typhoid fever. He (Dr. Crookshank) asked for the usual enquiries to be made as to the milk-supply, found it was supplied by a certain dairy, and ascertained that his own two cases had been supplied by the same milkman, which caused him to wonder whether they also were not typhoid. The following day the bacteriologist's report said that his colleague's case was not typhoid fever, but Dr. Crookshank disregarded this finding in the same way that he would a mathematical report. In the course of the afternoon he heard of another child with diarrhoea after taking milk from the same dairy. He then sent out a questionnaire to the medical men in the district to ask if they had had any cases of diarrhoea within the last fortnight, and he received fifty replies in the affirmative. The next district also had no typhoid but many cases of diarrhoea. In forty-eight hours the milk-supply of all the cases was traced to a dairy farm in Wiltshire, where the farmer's child had mild typhoid fever that had been diagnosed as meningitis, and her clothing had been washed in the milk churn.

Ultimately about one hundred and twenty cases of typhoid were traced to this milk-supply, but if he had waited for notification in the ordinary way, it would have taken two or three weeks, and then half the cases would have been missed. That was only one instance of what commonly happened. Experience of this kind rather went to show that these statistical enquiries did not represent what actually happened in the field, but what happened in the bureau of the Medical Officer of Health.

Dr. Crookshank said he would like briefly to refer to the advisability of not entirely discarding the miasmatic theory in dealing

with epidemics. He did not want to set it up in opposition to the theory of infection, but to show that there was room for both. There might be some atmospheric changes which allowed a certain number of people to become at a given time simultaneously susceptible to certain organisms, and then once they had developed the disease, they might then transmit the virus directly to other people. Unfortunately people argued as to which of the two theories was right; only a few people realized there was room for *both* theories. There would only be progress when proper attention was paid to the miasmatic side as well as to the theory of infection.

Last summer when there was hot weather due to cosmic change, people who were over-clothed suddenly changed their garments. This was due to some common cause. Later, other people did the same thing by way of imitation or "infection"! About the month of March or April, small boys suddenly began to play with tops all over the street. Why did that happen? They were people of a particular age, and only this particular population seemed to be susceptible to this epidemic of top-spinning. Was it "infectivity"? Did one boy infect another? Might it not be that there was some common impulse that brought boys forward at one time to play tops?

If one kept to the *facts* in the first place and then tried to get a better *theory* than Sir William Hamer's, Mr. Soper might be given material for a most delightful investigation, which Dr. Crookshank would support because it would be on his side.

MR. UDNY YULE said he did not feel competent at present to discuss the paper, as he had not had time thoroughly to follow it, but, with all respect to Dr. Crookshank, he would say that this was a very valuable paper. The only way of testing a theory was to see how far it could interpret such knowledge concerning facts as was available. It was unfortunate from that standpoint that there was so great a discrepancy between the facts available and those that were needed. At present there existed only facts concerning cases notified, whereas facts were required concerning cases occurring.

Mr. Soper had carried out a very capable and interesting piece of analysis that showed in detail what the consequences of Sir William Hamer's theory might be, and his conclusions did reproduce in a remarkable way many of the features of the statistics. How far that agreement in effect supported the theory must necessarily be a matter for persons better qualified than himself to discuss, but he thanked Mr. Soper for an extremely interesting paper which must have cost far more labour than appeared, because a great deal of labour had often been condensed into a mere table or a graph.

DR. HALLIDAY said that Mr. Soper had dealt at length in his paper with the Glasgow figures for measles, and it happened that he also had been working at them. At one time he had thought that he might be able to do something to them on the lines taken by Mr. Soper, but, as the mathematical processes involved were so intricate, he could not have accomplished the work so deftly. However,

the work was never undertaken because he found out that the result for Glasgow would apply only to that city, and entirely different calculations would be needed for other cities, such as Greenock, Edinburgh, and Aberdeen.

There was no time to go into all the epidemiological issues involved, but he might mention that one of the points that had been so far omitted in consideration of the subject of measles epidemicity was the nature of the topographical unit to be studied. This was very important, as every unit presented different features and the periodicity of measles took a different course in each. This diversity was associated with the fact that measles as outbreak did not develop simultaneously throughout a community. In Glasgow it began in September in one or more foci, and, if conditions were favourable, measles as outbreak spread from these foci in a radial manner along the lines of communication. If, however, conditions were not favourable, it did not spread as outbreak until January, February, or March.

Now, measles as outbreak takes time to move through a community. In Glasgow, when an outbreak began in September, it was found that it took twenty-four weeks to pass over the thirty-seven sections or wards of the city. On the other hand, if measles did not begin in the form of outbreak until January, February or March, it followed that the whole city would not be covered until June, July or August. But this did not happen because, owing to the interposition of another factor, the progression of the outbreak in space was frustrated in May or June. This other factor might be called the refractory period because it was found that, as far as Glasgow was concerned, all late epidemics collapse suddenly at the end of May, often leaving large tracts of the city unaffected.

To sum up, when measles began as outbreak in September or October, and conditions for its spread were favourable, there was time for it to travel throughout all sections of a city of the size of Glasgow. By covering the whole population a considerable increase in the immunity of the population resulted. Such early outbreaks reached their peaks in the late winter or early spring, and in the following annual period, owing to the high immunity produced, no epidemic occurred. If, however, measles as outbreak began late, *e.g.* in January or February, it had not sufficient time to cover the whole population before the onset of the refractory period in May, and consequently the city was only partially immunized. As a result of this partial immunization, measles again appeared as outbreak in the following annual period.

In Glasgow, as Mr. Soper's figures had shown, measles as outbreak occurred at two-yearly intervals for a number of years; then it had a phase of annual appearance, and recently it has reverted to the biennial type. When biennial, the outbreak was always considerable in extent and reached a peak in winter or spring; when annual, the outbreaks were smaller and reached a peak in May or early June.

In units smaller than Glasgow, measles as an outbreak could

rapidly cover the population and thus bring about a high immunity, even when the outbreak started somewhat late in the annual period. In the majority of smaller units examined it was found—as was expected—that measles would appear mainly in its biennial form. Such was the case for Greenock, Aberdeen and Dundee.

If the population was large, or if it was well dispersed throughout space, measles in the form of outbreak had seldom time to traverse the whole area before the Refractory Period set in in May, the result being that annual outbreaks predominated. Such was the case for towns like Paris and Edinburgh.

The best example of an extreme biennial appearance was to be found in Greenock, and of an extreme annual appearance in Paris. The majority of cities examined were intermediate in type. In Glasgow, biennial outbreaks predominated over annual. In London, annual outbreaks predominated over biennial.

The subject of measles epidemicity was, in Dr. Halliday's opinion, one that required further epidemiological investigation on a topographical basis, and only secondarily, if at all, should an approach be made mathematically. Mr. Soper was to be congratulated on a very fine piece of mathematical work.

Mr. CONNOR said he would like to associate himself with Mr. Isserlis and Mr. Yule in their remarks upon the mathematical aspects of the paper, and to express his appreciation of the remarkable skill and clearness, and of the ingenuity with which Mr. Soper had found his constant.

PROFESSOR GREENWOOD said he would like to add a word of appreciation of the beautiful work that Mr. Soper had done. Not only, as Mr. Yule had pointed out, was there an enormous amount of labour behind the single figures, but he ventured to suggest that the mathematical expression of the results was singularly elegant. He knew that he had had the advantage of reading the paper more than once, and that a method of presentation which on first reading might not seem simple, often proved, when mastered, enormously helpful. Mr. Soper's admirable work on Frequency Averages was an example. He suggested that Mr. Soper's plan in this paper of taking an epidemiological hypothesis, expressing that hypothesis arithmetically and determining how nearly it described the observations of others, was the one way in which one could hope to render more precise the description of epidemiological phenomena.

Mr. FLUX said he would like to associate himself with Professor Greenwood and other speakers, but particularly with Professor Greenwood in his remarks upon the neatness of the mathematical work put before the Society by Mr. Soper. Unfortunately he had not had a copy of the paper until he arrived at the meeting that afternoon, and there had naturally been insufficient time for him to do more than glance superficially at it, but that aspect of the work struck him forcibly.

He would put to the meeting the Vote of Thanks proposed by Sir William Hamer, seconded by Dr. Isserlis and supported by other speakers.

Mr. Soper intimated that he did not wish to make any attempt that evening to meet criticisms upon the paper, but would do his best if the editors of the *Journal* would allow him space for that purpose in due course.

The following written reply was received from him latter:—

I wonder if Dr. Crookshank's professed inability to understand mathematics is only a dark glass assumed that he may administer a destructive ray upon my use of the word disease? When I say "The mathematical picture is formed (so, and) we may suppose . . . the disease has powers of infecting," the disease is neither the "real occurrence," whatever those who use the term may mean, nor is it a "mental construct" involving "a single person manifesting a defined group of symptoms correlated with a single intra-corporal cause," as has been said. It is the picture of a passed ball and the mental construct is shorn of particularizing features as in the familiar bags of balls. The tactical advantage of the mathematics is admittedly taken, and I hope here at any rate gets me out of awkward controversy.

This mathematical process of naming and numbering and relating is surely the sole means we have of understanding complex things, and no statistician would surely cavil at the taking of a quotient, as a death-rate, to eliminate numbers. Some have thought that they could discern a relation between a quotient called infectivity and a difference called number of susceptibles, and there is no harm in carrying the argument through a succession of arithmetical repetitions to see what happens. The result is wrong, and now come in many helpful suggestions to show reason why.

Dr. Isserlis makes the valuable suggestion that the accessions of "susceptibles" might with more truth be made variable, and the consequence of this supposition should certainly be followed up.

Dr. Crookshank offers the mathematical notion (to my view) of a by-pass flow of susceptibles to the insusceptible state without going through "case," and this again should be examined, and if not a cogent factor in measles might be of dominating importance in such a disease as diphtheria. The miasmatic theory that connects infectivity with atmospheric conditions, in greater or less degree, may also have to be reckoned with to narrow down the unexplained balances. The further complexities of a changing susceptibility and "occasion" can perhaps be thought of as belonging to that class of determinants which have no statistical balances in the main account.

From Dr. Halliday, who has made a detailed study of measles epidemics in Glasgow, comes perhaps the most instructive criticism. Apart from the domestic heterogeneity characterizing the different wards and parts of a city, the fact that the parts are not going together, but that a case, or glut of cases, arising here or there

after the refractory period, intensify round the foci and propagate as waves over the remainder of the city is a phenomenon that may sadly upset the results of the simple hypothesis, especially if it takes, as he says, some twenty-four weeks for a wave to traverse the city. Truc, a mass action law pretends to eliminate local actions, their joint consequence being statistically ascertainable, but it may be that, when cases are few, the after development of the epidemics may depend materially upon their distribution upon the map, and for a statistical presentment, besides errors of number, there would have to be brought in error of spatial distribution, from norms.

Some synoptic charts of the topographical course of an epidemic in a large city like Glasgow would be of great interest in this connection, and perhaps an arithmetical propagation could be devised to simulate the demonstrated waves and strengthen the verbal explanations, always, of course, with the purpose of finding out how much can be explained and how much is left for explanation by less puissant agents and chance.

I wish to express my thanks for the criticisms offered and remarks made upon this attempt to continue a trail on a hastily chosen line, and to ask those who scent "mathematics" to see in the paper only a piece of simple arithmetic.

DR. A. SALUSBURY MACNALT, of the Ministry of Health, who was prevented at the last moment from attending the meeting, has since sent the following commentary on the paper:—

I should like to express my appreciation of Mr. Soper's mathematical interpretation of periodicity in disease prevalence, a welcome contribution to a complex and obscure subject.

As Mr. Soper has observed, the periodicity of epidemics of measles has been long recognized, and I would refer especially to Whitelegge's work in this connection. We know that there is a seasonal maximum prevalence of measles, and also that in large centres of population epidemics of measles occur, usually about every two or three years. A graphic record will show for measles biennial or triennial excesses of mortality.

Whitelegge terms these outbreaks "minor epidemics," and gives as their causes in urban centres—

- (1) The persistence of measles always ready to spread.
- (2) The accumulation of susceptible children getting nearer and nearer to the degree of density required for epidemic extension.
- (3) Climatic influences which from time to time (usually once but sometimes twice a year) afford in some way maximum facilities for the outbreak.

But Whitelegge in 1892 also drew attention to a cyclical change in the manifestations of measles; occasionally over wide or narrow areas. Successive minor epidemics become more and more virulent and destructive, owing, as he suggests, to progressive intensification of the measles virus; and these long waves, built up of many successive

minor epidemics, in his opinion, may fittingly be termed major epidemics. When the crest of the epidemic wave begins to rise a greatly increased mortality from measles may be anticipated, such as occurred in the "eighties" and the "nineties."

The causes of these major epidemics are obscure; they occur at long intervals. Whitelegge states their advent may be recognized by a progressive intensification of virulence of the biennial minor epidemics. At all events they cannot be entirely explained by the inflow of susceptibles.

Mr. Soper has found some difficulty in applying the equations to measles epidemics in Glasgow and also to outbreaks of diphtheria. He has, I think, anticipated criticism by putting his finger upon certain discrepancies. There is perhaps a false analogy between infection in disease and the mechanism known as chemical mass-action. The notification figures of measles in a district are, of course, unreliable with regard to the true incidence of cases of the disease in an epidemic. So many cases are nursed at home and remain un-notified. The registered deaths from measles furnish the best available statistical evidence.

Then in regard to the question of susceptibility in disease we have still much to learn.

In selecting measles for a trial essay of his hypothesis, Mr. Soper has chosen a disease in which there is a high degree of susceptibility. Nearly every child gets measles, and the inflow of susceptibles indubitably is reflected in the periodicity of minor epidemics.

It must be remembered, however, that the age at which susceptibles contract measles is to some extent variable and therefore disturbs the mathematical forecast. Certainly among the well-to-do it is the exception and not the rule for children in this social class to contract measles under five years of age. Because measles is most fatal to children in this age-period, all our public health efforts are directed to educating parents of all classes to guard young children under five years from exposure to infection. If this campaign has met with any success it will have postponed the onset of measles to a later age-period.

Halliday, in a recent report to the Medical Research Council, has shown that the period of child-life in which an attack takes place differs considerably according as circumstances vary.

He writes: "Among crowded tenement quarters housing a working-class population such as are to be found in Glasgow, the disease is essentially one of children under school-age. In the working-class and middle-class families of Birmingham and Willesden who live in houses of the single-entry type, the disease is predominantly one of scholars of ages five to ten. In country districts also the disease tends to be one of school-children of ages five to ten. Among the public-school class the age of attack seems to be postponed to a still later period of life. At the other extreme from the Glasgow tenements are to be found the very remote districts, such as the Highland glen mentioned by Brownlee, where all the inhabitants were attacked irrespective of age."

Halliday also found that a large number of the children in the

tonements of Glasgow did not contract measles although they were all presumably exposed to infection. He suggests that the conditions of exposure are such that susceptible children may respond either by acquiring the disease or by developing a partial and probably temporary immunity to it. This immunity on the part of a proportion of susceptibles may be one of the causes of the natural decline of an epidemic before it has reached the theoretically possible limits of its spread in the population.

I am especially interested in these findings of Halliday in relation to measles because this view is one I have advanced in regard to epidemic diseases of the central nervous system, although many would hold that only a limited number of susceptibles contract these diseases. It is also in accord with the theory of the "velocity of infection" elaborated by Surgeon-Commander S. F. Dudley.

I should be much interested to see Mr. Soper's formulæ applied to the interpretation of periodicity in the prevalence of epidemic poliomyelitis.

In these remarks I have merely endeavoured to sketch some of the epidemiological circumstances which may interfere with, but do not detract from, the value of his mathematical interpretation of periodicity in disease prevalence.

During the meeting the PRESIDENT announced that the Frances Wood Memorial Prize for the encouragement of work in social statistics, which had been offered for competition in 1928, had been awarded by the Council to Mr. C. G. Clark, for his essay, "A Graphical Analysis of the Unemployment Position during the period 1920-28." The President then handed Mr. Clark the cheque for thirty pounds which formed the prize, at the same time expressing his congratulations, and his satisfaction, which would be shared by the Fellows, that the Society was in a position to stimulate work of this kind.

The President then reminded the meeting of his reference, in November, to a Fellow of the Society, Mr. J. Russell Sowray, whose Fellowship extended over seventy-three years, and expressed his regret at the news received within the last week, that of Mr. Sowray's death at the age of ninety-eight, a regret which he felt would be shared by all present.

As a result of the ballot taken during the meeting, the five candidates named below were elected Fellows of the Society :—

Alistair McBride Armour, B.Com.

Henry Vincent Hodson.

Howard Granville Borden.

Peter Laird McKinlay, M.D., D.Ph.

Sir Atul Chandra Chatterjee.

MISCELLANEA.

A GRAPHICAL ANALYSIS OF THE UNEMPLOYMENT POSITION.

1920-1928.

(Frances Wood Memorial Prize Essay, 1928.)

By C. G. CLARK, B.A. (Oxon.),

Research Assistant, London School of Economics.

Summary.

(1) An investigation has been undertaken with a view to obtaining statistically valid information from the unemployment returns and similar data.

(2) Certain minor corrections necessitated by administrative changes in the basis of compiling the returns are discussed and introduced.

(3) Corrections for unrecorded short-time working are discussed and introduced.

(4) Seasonal fluctuations are removed from the figures.

(5) A method is suggested for obviating the difficulties due to a change in the basis of classifications of the unemployment returns in 1923.

(6) The resulting corrected unemployment figures are combined with figures for the total insured population to provide a monthly measure of employment, classified by industries.

General Nature of the Unemployment Returns.

The crudity of the ordinary unemployment figures, as a statement of the full economic facts of unemployment, is very manifest. It does not require the ludicrous half-truths which are drawn from these figures in current controversy to remind us of the numberless pitfalls which impede the full understanding of these statistics. The extreme gravity of the economic problem of unemployment renders it desirable that we should have accurate and complete statistics of the facts of unemployment, comparable from month to month and year to year, classified by industrial groups and also, if possible, by sex and age, and geographically.

As is well known, complete unemployment statistics for the whole wage-earning population only began with the Unemployment Insurance Act of 1920. For periods up till then, and, in the opinion of some writers, for periods since then, the only reliable information has been the "Trade Union Percentages" of unemployment, collected on a very limited basis. For since the original Act of 1920 there has been a constant succession of legislative changes affecting the administration of unemployment benefit, many of which have vitiated comparison of the unemployment statistics before and after their introduction. The trade union figures, however, only give a rough indication of the total amount of unemployment, while for separate industries they are almost valueless.

The problem, therefore, is to find methods of correcting certain known crudities, discontinuities and omissions in the Ministry of Labour's published figures of unemployment. From the figures thus purified it should be possible to calculate and remove seasonal fluctuations: then finally, by considering the figures in conjunction with those of the total numbers insured, we should be able to obtain a measure of employment in different industries. Unemployment figures are at present collected and published by the Ministry of Labour in connection with its administration of the Unemployment Insurance Acts. The main bulk of the industrial population was included in the scope of the unemployment insurance scheme by the Act of 1920: the workers in certain selected industries had been insured under the Acts of 1912 and 1916. Now there are two sets of figures of unemployment published by the Ministry, which often diverge widely. The first are the weekly returns, which are the figures generally quoted and discussed by the public. They are published in most of the daily papers and include all those on the "live register" of the employment exchanges (this term will be discussed presently). They are classified according to whether the applicants are men, women, boys or girls, and whether their unemployment is temporary or permanent, or whether their normal employment is casual. The weekly returns have not been classified according to industry, or occupation, since 1921.

The other returns, which are not as well known, are published monthly in the Ministry of Labour *Gazette*, relating to some date towards the end of each month. They are classified into temporary and permanent unemployment, and by sex; also they have a complete industrial classification into a hundred industrial subdivisions. For the purposes of this investigation some of these have been combined into larger groups, as explained later. These monthly figures are generally distinctly higher than the weekly figures for corresponding dates. This is owing to the fact that they refer to

slightly different totals: the monthly figures refer to "books lodged" rather than to "number on live register." Now merely because one is classified by industry and the other is not we are not entitled to choose the monthly figures for our purpose: if we have grounds for believing the weekly figures to be more accurate we should approximate best to the truth by applying a percentage correction to the figures for separate industries given in the monthly totals. However, there is little doubt that the monthly figures are far more accurate for our purpose, for the following reason. Apart from the main bulk of the unemployed, who are drawing benefit or will become entitled to draw it after the lapse of a few days, and a small number whose claim to benefit is exhausted but who are maintaining their registration, separate records are kept of two other classes. There is always a certain number—at any one moment some 50,000 or 60,000—of unemployed who do not come within the scope of the Acts because their normal work is at uninsured trades, such as agriculture or domestic service. Then there are certain of the insured unemployed whose claims to benefit are exhausted, or have been disallowed, who cease to trouble to register at the Labour Exchange and seek work elsewhere. If the local officials have certain knowledge of whether or not these people have found work they can be recorded; but if, as generally happens, nothing is known about them, their books are placed in a special file, where they are kept for two months, after which they are transferred to the "dead file." The weekly figures include the uninsured applicants but exclude the "two-months file," while the reverse is the case with the classified monthly figures. Our investigation must of necessity exclude the uninsurable industries, and hence we would wish to exclude persons in those industries from our unemployment totals. Further, we require some estimate included of those who are in fact unemployed, but whose names are no longer recorded at the exchanges. Hence in both respects the monthly figures are more valuable. The period of two months was chosen as the best average period after which an individual in these circumstances might be expected to have found work. From the published estimates of the relative frequency of periods of unemployment of different duration, derived from sample investigations undertaken by the Ministry in 1923 and 1924, we can obtain a rough idea of the duration of this "probable period of finding work." A length of two months can be roughly deduced from these data.

By the inclusion of the two-months file in the monthly totals, they are freed from the omission, which is so often commented on in the weekly totals, of those who have been deprived of benefit under one of the clauses of the Acts, who have ceased to register at the exchanges.

and are living on poor-relief or charity. The two-months file provides an estimate of their number.

Corrections due to Administrative Changes.

We have then in the monthly returns an industrially classified total for the whole of the unemployed, from this point of view. However, the next question which arises is whether these returns give a complete record of all the short-period unemployment and the short time, or, if they contain a partial record of the days of work thus lost, do they at any rate record a fairly constant proportion of this short-time unemployment, so that they remain comparable from year to year?

A summary of the legislative changes which might affect the comparability of the figures is given in *Survey of Industrial Relations*. The dangers of an introduction of an element of "incomparability" into the statistics consequent upon legislative changes arise partly from exclusion from the records of those suffering long periods of unemployment who have been deprived of benefit (this error is roughly corrected by the inclusion of the two-months file); but the greater danger of incomparability arises from the inclusion or non-inclusion in the returns of men suffering short spells of unemployment of less than a week's duration, owing to the varying inducements which may be held out before them to register at the employment exchange. The only considerable factor from this point of view is the length of the "waiting period." At the coming into force of the original Act in November, 1920, the waiting period was three days: this was raised to six days on 30th June, 1921, lowered to three days on 1st August, 1924, raised to six days again from 30th September, 1925. The waiting period is, broadly speaking, the length of time a man's name must remain on the unemployment register before he can claim for benefit (there are certain provisos also for those losing days in irregular sequence). It is clear that a man who knows he will get work again at the end of a week will not trouble to register if the waiting period is six days, but will register and secure half a week's benefit if the period is three days. (This is a slight over-simplification of the actual circumstances, but illustrates the nature of the problem.) The "gap," on the other hand, which was in force from 1922 to 1924, whereby at the end of five weeks' continuous unemployment a man had to spend a week without benefit, does not affect comparability, as clearly a man under these circumstances would maintain registration to qualify for benefit for the subsequent week.

The original Act of 1920 only allowed one week's benefit for every six weeks' contributions. Almost at once the greater part of the unemployed found themselves unable to meet this condition, and a

whole series of temporary Acts were passed. As a result of the first temporary measure, benefit was provided for most of the unemployed till about March, 1921. After that date large numbers became disqualified, many of whom ceased to register. The two-months file figures were not included in the totals till June, 1923. It will be remembered that, after the cessation of the coal dispute of April-June, 1921, there was apparently a rapid reduction of the unemployment totals in August and September. This, however, was almost entirely a spurious effect, and the terrific burden which was suddenly thrown on the poor-law caused fresh legislative provision to be made for those who were disqualified under the old Acts. From 2nd November, 1921, onwards a "Special Benefit Period" was introduced. There is no need to follow the further history of all the "Special Periods" which were subsequently introduced. Suffice it to say that from this date onwards, some provision was made for recording, either on benefit or on gap, practically all those who were unemployed on long spells. The entire set of figures from April to October, 1921, however, must be abandoned as valueless.

Up till June, 1923, separate figures were published (not analysed by industry after October, 1922) of those drawing benefit for "systematic short time." These figures are of no value for four separate reasons. Firstly, we have no information about the average proportion of the working week lost by the claimants. Secondly, the boundary becomes blurred between those who are losing three days a week (short-timers) and those who are losing a week or so per month (unemployed). Thirdly, the figures probably contain no record of those who are losing two days a week or less. And lastly, the distinction between "systematic" and irregular short time is of little economic significance. By the autumn of 1922 these figures of systematic short-timers, which had been very large, fell to some 60,000. From June, 1923, onwards only those who were unemployed on a given day were included in the totals, thereby maintaining comparability.

Before going on to discuss the question of the information available on the question of short-time working, it may be as well to summarize the legislative changes affecting comparability in the form of a calendar of the crucial dates. As mentioned above, a complete account of all the legislation on this subject is to be found in the Balfour Committee's Report.

8 November, 1920	...	General Unemployment Insurance begins.
March, 1921	...	Substantial numbers of unemployed become ineligible for benefit.
30 June, 1921	...	Waiting period raised to six days.
2 November, 1921	...	General re-institution of benefit.

31 March, 1922	...	Southern Ireland administration separated.
June, 1923	...	Half-timers included in totals. Change in industrial classification.
1 August, 1924	...	Waiting period reduced to three days.
30 September, 1925...	..	.. raised to six days.
2 January, 1928	...	Old age pensioners aged 65-70 excluded from returns.

It is clear that some separate method of estimating short time will have to be found, making arrangements to prevent overlapping with those short-timers who are already registered as unemployed. Apart from this there are three minor corrections to be made. The figures subsequent to December, 1927, must be raised to allow for the estimated numbers of unemployed between 65-70. The figures for August, 1924, to September, 1925, must be lowered to allow for those brought on to the register by the reduced waiting period and other provisions of the 1924 Act, and the figures prior to April, 1922, must be lowered by the estimated unemployment in Southern Ireland.

Official estimates are available of the changes due to each of these causes. It is estimated that 25,000 persons lost benefit in January, 1928, 70,000 were brought on to the register in August, 1924, and that there were 50,000 taken off the register on the separation of the Irish Free State in 1922. These figures are totals: their distribution among industries was estimated as described in the Appendix. It was thus possible to calculate a small percentage correction to the unemployment figure for each industry for March, 1922, for August, 1924, for January, 1928, respectively. The first set of corrections was applied to all the data before March, 1922, the second to the data for August, 1924-September, 1925, the last to all data since January, 1928. Examples are given in the Appendix.

Unrecorded Short-time Working.

As discussed above, the unemployment returns are defective in that a good deal of short-time working probably escapes them, especially when its incidence is in periods of a day or half a day at a time. The other available information falls under three heads.

(1) For the coal industry there is a compulsory monthly return giving the number of days per week on which the pits were working, distinguishing stoppages due to holiday or dispute, and also the average number of wage-earners on the colliery books. Hence we can calculate accurately the number of hours actually worked per week.

(2) For the iron and steel, shale and ore, cotton, wool and worsted, boot and shoe, pottery and brickmaking industries, the Ministry of Labour *Gazette* publishes monthly figures of the number of hours lost, and worked overtime, by the employees of certain firms in each

of the above industries which furnish voluntary returns. These figures are not so valuable as the mining industry figures, but may be taken as representative.

(3) For other industries we only have records for four separate dates in 1924, in which year a census of hours, earnings and short time was undertaken by the Ministry of Labour on a voluntary but fairly wide basis. It appears that during a normal week in 1924 some 12 million hours were lost through short time, as compared with some 500 million hours actually worked, and some 50 million lost through unemployment. (These figures are only to give the order of magnitude.)

It is not permissible to assume that the short-time figures for 1924, which are probably fairly accurate, hold good for the adjacent years. A second-order approximation would be to assume a constant relationship between the total of short time and the total recorded unemployment. Assuming for the moment that none of the short-timers register at the exchanges (this assumption will be examined later), we have, for instance, in the *shipbuilding and marine engineering* industry :—

Normal Hours, 47 0. Total Employees (mid-1924), 321,000.

	Jan., 1921	April, 1924.	July, 1921.	Oct., 1921.
(1) Average no. of hours lost per week	3 0	1.9	1.5	1 5
(2) Recorded unemployed for month (thousands)	102 6	90 0	83.3	90 1
(3) Unemployed equivalent to short time in (1)	20.5	13 0	10.3	12.3
(4) Line (3) as % of line (2)	19.9	14.5	12.4	13.6

The hours lost per week are expressed as average per employee, not as the average per short-timer. The line (2) is calculated from two returns: the April figure, for instance, is the mean of the figures for end-March and end-April in the monthly returns. Line (3) is calculated by dividing the hours lost by 47 and multiplying by 321,000, the total of insured employees: this gives us the amount of unemployment which would be equivalent to the short time. The ratios of line (4) are somewhat disturbed by the stoppage of the railways in January. It is suggested that if an addition of some 15 per cent. be made to the recorded unemployment in this industry, we shall have a figure which includes short time as well as unemployment (assuming as before that no short-timers are already on the unemployment registers).

Percentage corrections on this basis have been calculated for all the industries not covered by the Ministry of Labour's separate monthly reports. The highest correction is for the clothing trades,

where some 600,000 workers lose on an average 3 hours a week each out of 47, the recorded unemployment being only about 35,000. These figures suggest a 75 per cent. addition to the unemployment returns to cover short time. The next in order of magnitude are the textile finishing trades, 59 per cent. and the silk industry 50 per cent. There are no other high figures. Most of the smaller industries, such as leather, chemicals, paper, woodworking, rubber, give figures ranging from 25-30 per cent. Engineering and public utility service give low figures, about 5 per cent.: while in the iron and steel industries, motor manufacture and electrical engineering an overtime week appears, on the balance, to be worked. The table of percentage corrections, calculated as above, for the various industries, is given in the Appendix.

The next point which arises is the question as to how far the short-time figures, calculated as above, are to be added to the recorded unemployment. There are probably during any week about 50,000 "systematic short-timers" (under the classification which was abandoned in 1923): which corresponds to about 25,000 unemployed on any one day. This amount of overlapping is definitely established: there may, of course, be much more due to the registration of "irregular" short-timers. These 25,000, forming some 2 per cent. of the unemployed, seem to have remained a constant factor since 1923. Owing to this, to their fewness relative to the total number of unemployed, and to the uncertainty of their distribution by industry, it was decided not to attempt to eliminate this factor, but to leave it as a small constant error.

Figures for the Mining Industry: Over-lapping of Unemployment and Short-time Figures.

A much more important question relates to how many of the short-timers estimated as above may be considered to have registered as ordinary unemployed on the day on which the Ministry's monthly count is taken. Fortunately we can obtain a complete solution of this problem for one industry—the mining industry. For this industry we have, as well as the Ministry of Mines figures mentioned above, of wage-earners on the colliery books and number of days worked by the pits, the Ministry of Labour figures of unemployment and of the total number of insured miners (from an annual count). It will be seen that we can thus secure from the Ministry of Mines figures a record of the actual amount of employment, taking all short time into consideration, and compare this with the employment estimated from the Ministry of Labour's figures. We can thus present forthwith the full employment index for the mining industry, and at the same time obtain some idea of how many of the short-

TABLE I.

Employment Figures for the Mining Industry (000's omitted).

I. Interpolated figure for total employees from annual July count less 60,000 as indicated.

II. First column less recorded unemployment.

III. Number of wage-earners on colliery books.

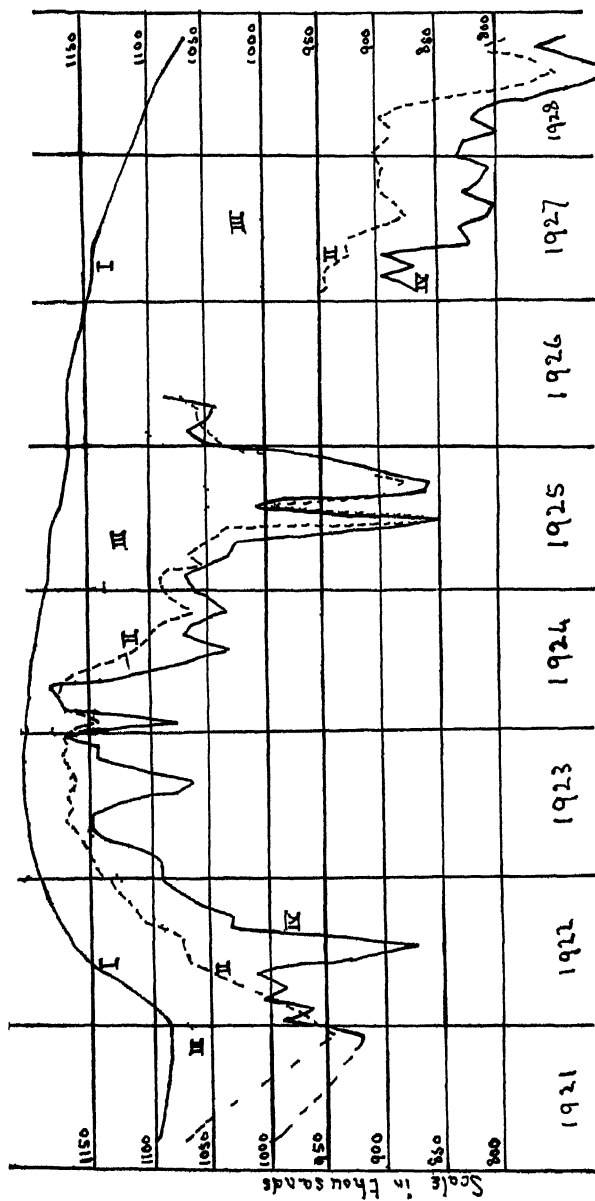
IV. Equivalent number of wage-earners working a full week (5·8 shifts).

	I.	II.	III.	IV.		I.	II.	III.	IV.
1921.					1925.				
Mar. ...	1094	1066	1198	989	Jan. ...	1190	1090	1139	1071
Nov. ...	1083	944	1063	923	Feb. ...	1188	1057	1137	1056
Dec. ...	1088	962	1070	987	Mar. ...	1187	1066	1126	1034
					Apr. ...	1186	1048	1108	1026
1922.					May ...	1183	1036	1096	942
Jan. ...	1095	977	1064	961	June ...	1180	865	1058	849
Feb. ...	1107	1000	1074	1004	July ...	1178	993	1048	1011
Mar. ...	1126	1025	1084	986	Aug. ...	1176	896	1048	868
Apr. ...	1140	1048	1088	1011	Sept. ...	1175	882	1056	860
May ...	1153	1068	1094	932	Oct. ...	1173	926	1061	921
June ...	1165	1070	1088	868	Nov. ...	1172	982	1069	981
July ...	1171	1073	1083	944	Dec. ...	1172	1032	1085	1047
Aug. ...	1177	1094	1096	1033					
Sept. ...	1182	1111	1104	1031	1926.				
Oct. ...	1187	1119	1115	1062	Jan. ...	1172	1046	1100	1063
Nov. ...	1191	1130	1121	1077	Feb. ...	1172	1053	1107	1053
Dec. ...	1194	1137	1129	1094	Mar. ...	1172	1056	1112	1043
					Apr. ...	1172	1074	1107	1084
1923.									
Jan. ...	1197	1141	1135	1093	1927.				
Feb. ...	1200	1149	1140	1098	Jan. ...	1150	949	996	867
Mar. ...	1202	1158	1147	1135	Feb. ...	1147	949	1013	896
Apr. ...	1203	1164	1154	1150	Mar. ...	1146	940	1025	870
May ...	1205	1170	1158	1150	Apr. ...	1145	927	1029	900
June ...	1207	1165	1163	1137	May ...	1143	933	1026	824
July ...	1208	1170	1164	1076	June ...	1139	905	1012	830
Aug. ...	1208	1164	1166	1062	July ...	1134	878	995	818
Sept. ...	1208	1169	1169	1115	Aug. ...	1130	885	985	800
Oct. ...	1208	1176	1176	1143	Sept. ...	1127	898	982	828
Nov. ...	1207	1174	1180	1142	Oct. ...	1123	900	983	811
Dec. ...	1207	1177	1185	1178	Nov. ...	1118	896	979	803
					Dec ...	1114	907	976	835
1924.									
Jan. ...	1206	1148	1186	1075	1928.				
Feb. ...	1206	1175	1187	1176	Jan. ...	1111	895	972	828
Mar. ...	1205	1178	1188	1181	Feb. ...	1108	888	958	797
Apr. ...	1203	1178	1191	1188	Mar. ...	1103	898	950	819
May ...	1202	1164	1192	1112	Apr. ...	1099	885	935	809
June ...	1200	1140	1186	1063	May ...	1093	842	930	761
July ...	1199	1113	1178	1033	June ...	1088	782	920	724
Aug. ...	1198	1101	1170	1072	July ...	1082	749	902	702
Sept. ...	1197	1094	1160	1063	Aug. ...	1075	771	895	723
Oct. ...	1194	1064	1146	1037	Sept. ...	1070	813	896	762
Nov. ...	1193	1080	1137	1045	Oct. ...	1064	784	899	738
Dec. ...	1191	1092	1140	1067					

DIAGRAM I.

Employment in the Mining Industry

(for key to curves see Table I opposite)



timers are registered as unemployed. The figures are plotted on Diagram I. The totals are collected on not entirely comparable bases: the Ministry of Labour figures, as opposed to the Ministry of Mines, exclude boys of 14-16 and old men over 70, while including the non-manual workers. There are two separate dates at which the pits were working completely full-time—in April, 1923, and again in April, 1924. On each of these occasions the Ministry of Labour figures exceeded the others by some 60,000, so a uniform deduction of 60,000 has been made from all the Ministry of Labour's figures in plotting. This should give a fairly good comparability. In calculating the "number of days worked per week," days lost through holiday or dispute are counted as worked, since those not working through these causes would not register as unemployed. In the same way voluntary absenteeism on days when the pits are open does not enter into the reckoning as unemployment, because we calculate employment by multiplying the number of men on the colliery books by the number of days on which the pits were open or would have been open but for holidays or dispute. It will be seen that the assumption is made that all the wage-earners on the colliery books (*i.e.* all those who were paid for any work during the week) were at work on each day the pit was open. This will be the case except where the working of a seam in the pit has been either started or abandoned *within the week*. On the other hand, it is assumed that no wage-earners work for two collieries within one week. Both these effects are probably small; it will be seen that they both lead to the conclusion that the employment figure, low as it appears to be when calculated by this method, is still a slight over-statement of the actual amount of work available.

The results of this investigation are rather striking. The true employment figure, taking short time fully into consideration, the quantity we require to measure, is plotted in the lowest curve on Diagram I. The "observed employment" figure is calculated from the Ministry of Labour returns by subtracting the recorded unemployment from the estimated population of the industry and is plotted in the broken curve. If this coincides with the lowest curve, we may take it that it can be used as an employment index without further correction. If it coincides with the dotted curve, which represents the number of wage-earners on the colliery books, we may take it that it provides a record of all those getting *any* employment, and must be corrected by the full figure for estimated short-time; and if it lies between the curves, must be corrected by part of the estimated short-time figure. We see from the diagram that during the period of moderate prosperity up to mid-1924 very few of the short-timers appear to have registered for unemployment, although there was a

considerable amount of short time worked, equivalent to about half the recorded unemployment. During the period of rapid decline which follows, the broken curve runs down till it coincides with the lowest curve. (The amount of short-time working is, of course, given by the difference between the lowest and dotted curves: the amount of recorded unemployment between the broken and uppermost.) Since 1926 the broken curve has remained between them.

This subject would repay further investigation, using the classification of unemployment figures into permanent and temporary which has been available since 1926. However, it may be taken as a general rule that at any rate in times of expanding employment the full short-time correction must be applied. But it may be noted that in the mining industry at present short-time working is almost universal, spells of employment are irregular, and the mass of the wage-earners is on the verge of destitution. All these are factors which make for the fullest number possible of unemployment registrations; yet it is clear that even in these last two years, till the last few months at any rate, the greater part of short time is not registered. Hence for the purposes of this investigation the short-time corrections, for other industries, were provisionally applied in full.

Seasonal Movements.

The next step in the investigation is to remove the seasonal variations. The most refined process for this extraction is to take the median of all the percentage changes recorded for each January–February, each February–March and so on. This method, however, contains the assumption that the amplitude of the seasonal movements is proportional to the volume of unemployment. It seems far more probable, however, that the amplitude will be proportional to the volume of *employment*, which is to all intents and purposes constant relative to the quantities with which we have to deal. Hence the absolute and not the percentage changes in unemployment from month to month have been analysed for seasonal movements, for each industry. The method for each industry, or group of industries, may be illustrated by the following calculation for the *food, drink and tobacco* group of industries. The first step is to compile a table showing the *absolute changes* from month to month in the total of unemployment in the industry. The *medians* of all the June–July changes, all the July–August changes, and so forth, are then taken. These are the first column of Table II. In the second column the cumulative algebraic sum is given, showing the difference of each month from June. The algebraic sum for the twelve months differs from zero to the extent of 3,600 owing to a secular tendency to

improvement. In the next column a cumulative correction of 300 a month is applied to eliminate this. In the first column 3,600 is subtracted from each figure to reduce the algebraic sum to zero. This gives the figure which must be subtracted from the unemployment return for each month to remove the seasonal effect. The same procedure was followed in each industry. The unemployment returns were those of 1923-27 or, where possible, 1921-27. It was found that with the exception of iron and steel, engineering and textiles, every industry showed a seasonal movement. Most of the curves are of similar shape, employment being highest in the summer: some of the more curious seasonal curves are those for the clothing, shipping, shipbuilding and motor industries.

TABLE II.
(Figures in thousands.)

End of month.	Median deviation from previous month.	Median deviation from June.	Corrected for trend.	Seasonal correction to be applied.
July	-3.0	-3.0	- 2.7	-6.3
Aug.	+1.2	-1.8	- 1.2	-4.8
Sept.	+2.5	+0.7	+ 1.6	-2.0
Oct.	-0.5	+0.2	+ 1.4	-2.2
Nov.	+3.0	+3.2	+ 4.7	+1.1
Dec.	+1.5	+4.7	+ 6.5	+2.9
Jan.	+3.7	+8.4	+10.5	+6.9
Feb.	-2.0	+6.4	+ 8.8	+5.2
Mar.	-1.7	+4.7	+ 7.4	+3.8
Apr.	-3.0	+1.7	+ 4.7	+1.1
May	-3.3	-1.6	+ 1.7	-1.9
June	-2.0	-3.6	0	-3.6

Insured Population.

Having applied all these corrections to the unemployment figures, there lastly remains the fundamental consideration of changes in, and transfers to different employments of, the insured population. The numbers of workers in each industry are obtained by an annual count held by the Ministry in each July, published in the following November. By combining these with the unemployment figures we obtain, for July at any rate, figures of the actual amount of employment in each industry. The remarkably misleading impressions that can be obtained by considering the unemployment figures apart from the employment figures can best be exemplified by the association of falling unemployment in the engineering or shipbuilding industries with stationary or falling employment. There is no need to emphasize the differences, not only in trend, but in slope at any given moment, between the two series.

For the purpose of this investigation monthly figures are

required. These are obtained by interpolation. The data for each successive July are plotted and a smooth curve drawn through them freehand. It may be objected that changes in the industrial population are liable to take place with less smoothness and that interpolation is unreliable; or at any rate, while interpolation may be permissible up to the date of the last count, extrapolation to obtain figures for the months after the last count is not permissible. This second point may readily be conceded. In this investigation the figures for the employed population between July, 1927, and the time of writing (October, 1928) have been calculated by a different method. A record is kept by the Ministry of Labour of all the "new entrants" into Unemployment Insurance. These are, of course, largely juveniles of 16: there are some adults. Concerning each adult a systematic search is undertaken before the name is entered in the records, to ensure that all duplication has been avoided. The totals are published for each month: by the courtesy of the Statistical Department of the Ministry of Labour it has been possible to consult the tables for separate industries. Now the increase in the personnel of any industry for a given period will be—

(New Entrants)—(death and emigrations)—(transfers to other industries) + (transfers from other industries).

The first two factors are the largest. For the period July, 1926–July, 1927, we know the actual change of personnel for each industry and the new entrants. Hence we can calculate the sum of the other three factors (called by the Ministry "gross losses"), but not, of course, the factors separately. The gross losses differ somewhat from industry to industry; but they contain a large steady element in the deaths and emigrations: so the method of this investigation has been to assume that "gross losses" for each industry continued for 1927–28 at the same proportional rate as in 1926–27, and did not differ from month to month. Hence, knowing the figures for new entrants separately, it was possible to estimate the personnel of each industry monthly.

This refinement should be applied, strictly speaking, not only to the extrapolations but also to the interpolations. The figures for new entrants, however, varied so little from month to month that it was decided that the interpolations were accurate enough for their purpose.

Concerning the range of workers covered by the Unemployment Insurance Schemes, the Acts lay down that all manual workers shall be insured, and all non-manual workers in receipt of remuneration less than £250 per annum, with the exception of those engaged in agriculture, domestic service, certain occupations on the railways, and the majority of grades of employment under the Government and

local authorities. It may be stated here that the classification is strictly industrial, that is, the workers are classified according to the commodity or service produced by their employer, not according to the occupations they severally pursue. Furthermore, workers are only classified as Government service or local authority service when they are engaged on certain specified functions, such as postal service, tax collecting, road making: the workers, for example, in a state-owned cordite factory or a municipally-owned tramway service will be classified as Explosives Industry and Road Transport Industry respectively. This is undoubtedly right, for they would be classified thus if the work were carried on by private enterprise, and the transfer from one ownership to another should not affect the head under which we classify the industry.

Now concerning railway service, those grades which are exempted from the insurance scheme are those in which, in the opinion of the Ministry, employment is regular and secure. Hence we may take it that the published unemployment figures cover practically all the unemployment among railwaymen. The same argument applies to the industries of national and local Government Service, and also the industries of gas, water and electricity supply and tram and bus service. For these two latter industries are often undertaken by local authorities, and a certain number of the workers guaranteed employment and exempted from the insurance scheme. Hence the unemployment figures are substantially correct except for their exclusion of agriculture, domestic service, and the higher grades of clerical work. But the figures of employed workers are inadequate for all the industries mentioned above—railway, tram and bus, gas, water and electricity, Government services. However, there are figures published in the Ministry of Labour's occasional reports of the number of exempt workers on the railways, and in the local government and public utility service. It is only possible to obtain a composite total for these latter, so local government service proper, tram and bus, and public utility must be classified together. Hence we can compile employment figures for these industries.

The Ministry of Labour counts of exempt workers available for this purpose are as follows (figures in thousands) :—

	July, 1923.	July, 1926.
National and Local Government and Public Utility Service	81.5	108.0
Railway Service	414.5	415.8

In addition to these a steady 300,000 odd have been recorded as staffs of Government offices (non-manual workers).

TABLE III.

Seasonal corrections to be added (—) or subtracted (—) to the Unemployment Returns for Principal Industries (000's omitted).

End of month.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Building and Contracting ...	-39.6	-23.0	-2.6	+13.7	+24.6	+24.3	+17.4	+16.3	+9.3	-1.8	-19.0	-25.1
Shipbuilding ...	-5.1	-0.7	+0.8	+4.4	+9.0	+7.7	+6.3	+0.5	-2.2	-6.5	-8.2	-7.7
Other Metal Industries ...	-1.9	-0.8	+0.4	+0.3	+1.9	+1.0	+0.3	-1.5	-2.0	-0.5	+0.4	+1.3
Clothing ...	-14.9	-5.8	-7.4	+12.5	+12.6	+14.1	+6.5	-5.0	-6.7	-3.8	-9.5	-7.2
Motor Manufacture	+0.2	+0.9	-2.1	+2.8	-3.3	+2.7	+0.1	-3.5	-4.1	-2.9	-1.6	+0.3
Food, Drink and Tobacco ...	-6.9	-5.2	-3.8	-1.1	+1.9	+3.6	+6.3	+4.8	+2.0	+2.2	-1.1	-2.9
Other Finishing Industries ...	-2.0	-0.5	+0.8	+1.0	+1.5	+0.8	-1.2	-1.4	-2.1	-0.3	+0.4	-2.3
Printing ...	-1.5	-1.6	-0.6	-0.4	+0.1	+0.4	+0.9	+0.3	+0.5	+0.3	+0.6	+1.0
Commerce and Distribution	-10.2	-10.9	-7.2	-0.4	+4.3	+8.3	+8.7	+5.3	+2.6	-1.7	-3.2	+4.3
Government and Public Utility ...	-5.4	-3.2	-1.3	0	+2.0	+3.9	+4.4	+3.2	+2.1	-0.5	-3.4	-1.9
Other Services ...	-7.1	-5.5	-2.9	+2.9	+4.4	+7.7	+7.9	+6.9	+4.8	-4.8	-9.1	-5.2
Railways ...	-2.3	-1.1	-0.6	+0.4	+1.1	+1.4	+1.6	+1.3	+1.0	-0.2	-1.3	-1.3
Shipping ...	-2.6	-1.8	+0.2	+1.4	+1.9	+2.3	+1.0	+1.2	+1.6	-0.8	-2.0	-2.5
All Industries except Coal-mining	-96.6	-59.0	-6.1	+28.9	+58.4	+65.3	+57.5	+33.4	+17.0	-12.7	-47.3	-40.6

Industrial Classification.

It now remains to describe the classification into industries. This was made extremely difficult by the radical changes introduced by the Ministry in 1923. The pre-1923 classification was probably not a true industrial classification, but was partly occupational. Several schemes were tried for recombining the post-1923 groups, one of the objects in view being to secure some measure of comparability with the pre-1923 figures. The grouping finally adopted was as follows. (Where one of the classifications is compounded of several of the Ministry of Labour's classifications they are given after it in brackets.)

I. TEXTILES.

Cotton.

Wool.

Silk.

Other Textile Materials (Jute, Hemp, Linen, other Textile Industries).

Textile Bleaching, Dyeing and Finishing.

II. Brick and Tile.

Pottery and Earthenware.

Building Trades (Building, Public Works Contracting).

III. HEAVY INDUSTRIES.

Iron and Steel (Iron Ore, Pig Iron, Steel Smelting and Rolling—Tin Plates, Tubes, Wire).

Electrical Industries (Electrical Engineering, Contracting, Cable Manufacture).

Engineering (General Engineering, Constructional Engineering, Railway Carriage and Wagon).

Shipbuilding (Shipbuilding, Marine Engineering).

Other Metals (All other Metal Industries except General Iron-founding and Jewellery).

IV. FINISHING INDUSTRIES.

Clothing (all Clothing Industries except Boots and including Hosiery, Lace and Carpets).

Boot and Shoe.

Motor Industry (Motors, Carriage Building).

Food, Drink and Tobacco (including Fishing).

Printing, Publishing and Bookbinding.

Others (Jewellery, Furniture, Rubber, Linoleum, Scientific and Photographic Apparatus, Brooms and Brushes, Musical Instruments, Toys).

V. SERVICES.

Commerce and Distribution (Distributive Trades, Commerce, etc.).

Government and Public Utility (National and Local Government, Tram and Bus, Gas, Water and Electricity).

Other Services (Hotel, College and Club, etc., Laundries, Entertainments, Professional Services).

VI. TRANSPORT.

Railways.

Road Transport (not Tram and Bus).

Shipping.

Dock and Harbour.

Warehousing, etc.

VII. ALL OTHER INDUSTRIES.

Manufacturing Producers' Goods (Stone Quarrying, Miscellaneous Mining, Coke, Glass Bottles, Tanning, Paper Manufacture, Wood Boxes).

Manufacturing Builders' Materials (Clay and Sand Digging, Cement, Concrete, Glass, Paint, Stove, Grate and General Iron Founding, Heating Engineering, Wall-paper, Slate Quarrying).

Others (Chemical Industries, Woodworking, Paper Goods, Leather Goods, Miscellaneous Industries, apart from branches already specified).

VIII. Coal-mining.

Some of these combinations may appear rather unusual, but they were mainly made with a view to preserving some comparability with the pre-1923 figures. With these data we can compile a group comparable with the total of Group VII, but not its three subheads, for the earlier period. As, however, before 1923 there was only one entry for Woodworking, and as Furniture is the largest woodworking industry, the unemployment under this head before 1923 was not included in Group VII, but added to the figures for Jewellery, Rubber and Linoleum to form a truncated substitute for the last subhead of Group IV. The other classifications, however, are valid both before and after 1923, as may be seen by comparing them with the entries in the Ministry of Labour *Gazette*.

Not only, however, in cases like this, but in nearly every industry, the pre-1923 counts of the insured population cannot be compared with the subsequent counts. We might take the pre-1923 figures for unemployment as approximate, because although they contain errors

of the same proportion as the insured population counts, these errors will be absolutely smaller. Even this, however, is undesirable. The only other method we have of measuring the working population for this period is by the Census of 1921. The industrial classifications of the Census are with small exceptions comparable with the Ministry's classifications for 1923 and subsequent years; but they differ on the following important points:—

- (1) The Census excludes Northern Ireland.
- (2) The Ministry's figures only cover the population aged 16–70.
- (3) The Census includes workers earning over £250 a year (employers and independent workers can be subtracted from the figures).

We have no means of estimating the amount of these differences between the Census and the "Ministry of Labour basis" in 1921. We can estimate them indirectly, however, by a very fortunate coincidence. The employment figures in the Census of Production 1924 were collected exactly on the basis of the 1921 Census, industrially and geographically, and with no age or income limits. By averaging the twelve monthly data calculated by the method of this paper we can obtain for each industry the "employment" in 1924 on the Ministry of Labour basis. By comparing this with the Census of Production figure we can obtain a percentage correction to apply to the 1921 Census figure to bring it to a "Ministry of Labour" basis. As this percentage correction represents a combination of three separate factors, its "probable variations" from year to year will be smaller. There is, however, one difference between the Population Census and the Census of Production methods of obtaining figures of employment: the former includes all those absent from work through sickness on the date of the Census, and a certain number of more or less superannuated workers not definitely retired. This is corrected by means of the figures suggested by Professor Bowley in *The Division of the Product of Industry*, a reduction of 6·2 per cent. being applied to the Census figures—3·2 per cent. for sickness and 3 per cent. for superannuation. The 1911 Census results, however, worked up on this basis, will not be so accurate as the 1921 results, apart altogether from the difficulties of comparing the industrial classifications in the two years. (The Balfour Committee's figures have been used in this connection.)

We thus obtain a figure for 1921 which can be "linked" on to the 1923 figures. Before the change of classification there were four counts, in May, 1921, October, 1921, February, 1922, and July, 1922. These not only differ widely from the later figures, but among them-

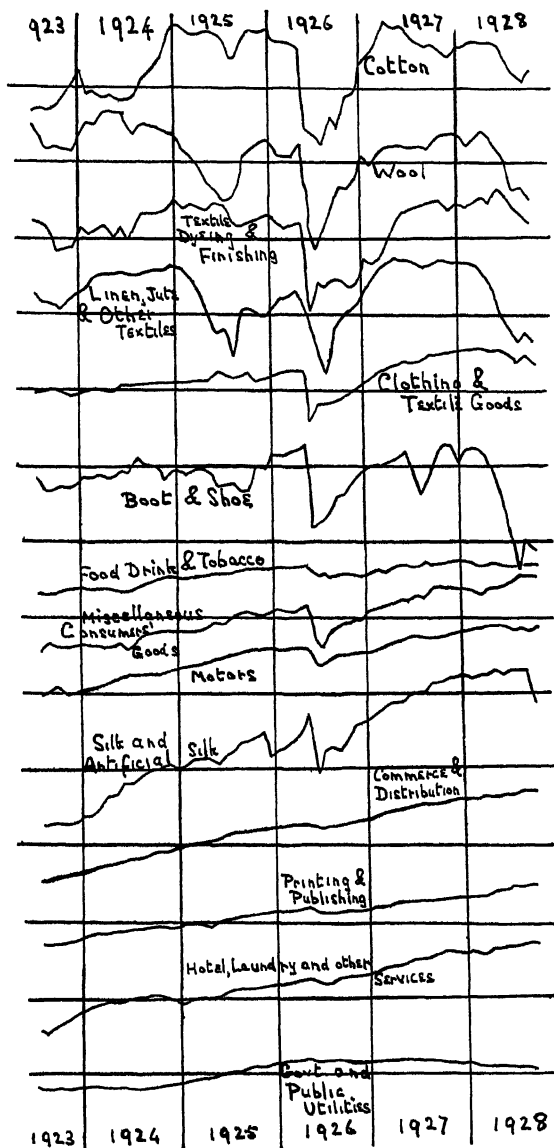
selves, the first in particular showing large variations from the others. It therefore appeared desirable to draw up for each industry a "bad" curve, based on these counts, as well as a "good" curve based on the Census, in order to correct the unemployment figures. The former shows the number of employees estimated for the industry by whatever method of counting—occupational, industrial, or mixed—the Ministry had in force at that time (and it appears to have changed its method of counting in 1921 as well as in 1923). The worst case is the engineering industry, which seems to have been based entirely on an occupational count before 1923, so that at the reclassification its numbers appeared to fall from 1,200,000 to 800,000. Therefore the recorded unemployment in the engineering industry for the month before the change-over was reduced by a third in order to compare with later figures. In the summer of 1921 the Ministry's figure for this industry was 1,255,000 against the Census 875,000, so the recorded unemployment is reduced by 30 per cent. The population figures from which these corrected unemployment figures are subtracted are obtained by interpolation between the 875,000 Census figure and the 800,000 1923 Ministry count. This same method is applied to all industries. The curve of employment for some industry in particular cannot be corrected with much certitude by the method indicated, and there is some discontinuity at the change-over. For most industries the pre-1923 results can be taken as fairly good approximations, but of a lower order of accuracy than the later curves.

The foregoing gives a complete account and discussion of the methods by which this employment index is obtained. A brief summary is included at the beginning of this essay. The figures have been calculated for each month and are so plotted. The tables are given quarterly. The complete results of the investigation are condensed into the employment tables, which are plotted on the charts. The method of calculating the employment index for dates prior to 1923 is given above; but in view of the fact that some of the details have not yet been perfected it was decided not to publish at this stage the provisional figures obtained. The curves and their inter-relationships suggest innumerable comments and explanations. But beyond noting the large single factors which cause sudden rises and falls in the curves, no attempt has been made to comment on the economic changes which these curves so clearly reveal. That should be the subject of a separate investigation. The main disturbing factors are, of course, trade disputes. The effects of the coal stoppage of May–November, 1926, call for no comment. Other considerable stoppages were the lock-out of boiler makers, which dislocated the shipbuilding industry, May–November, 1923; the dock

TABLE IV.
Final corrected Employment Figures, by Quarters, June, 1923—September, 1928, for certain Industries (figures in thousands).

Year	1923.			1924.			1925.			1926.			1927.			1928.		
	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.
Cotton	410	417	465	424	423	459	531	516	507	504	520	498	510	493	489	496	468	456
Wool	234	219	237	241	234	233	239	208	187	214	223	213	217	216	225	236	204	186
Textile Finishing	96.9	87.9	94.0	94.2	91.1	97.8	102.7	99.8	100.8	96.0	97.6	96.0	91.9	99.8	102.0	101.1	103.7	95.6
Miscellaneous Textiles	164	148	155	164	163	165	166	154	139	147	138	166	168	169	168	163	139	133
Clothing	481	483	480	484	480	494	493	497	507	507	505	510	514	521	535	541	544	533
Boots and Shoes	118.0	116.0	118.8	117.8	119.6	124.0	122.6	123.6	117.6	116.0	126.8	127.4	123.6	118.8	124.7	126.1	97.6	95.4
Food, Drink and Tobacco	464	467	469	465	469	481	481	485	487	493	497	498	497	497	500	505	499	495
Miscellaneous Finish- ing Industries	239	241	243	245	243	253	253	255	260	266	268	268	271	279	286	283	283	292
Motors	198	200	202	206	209	210	215	219	222	226	226	227	231	236	237	241	244	246
Silk and Artificial Silk	33.4	33.3	34.1	36.2	33.2	39.9	40.4	40.7	41.8	43.6	41.6	43.8	41.4	48.9	51.1	53.3	54.3	49.8
Commerce and Distri- bution	1395	1414	1435	1460	1452	1509	1534	1557	1583	1602	1620	1633	1620	1719	1788	1759	1776	1786
Printing and Publish- ing	215	217	220	222	225	227	228	228	231	234	236	233	234	242	245	247	249	252
Hotel, Laundry and other Services	451	472	490	493	504	509	507	511	521	527	524	531	526	555	577	591	602	609
Govt. and Public Utility Service	740	738	739	740	739	740	747	754	766	773	781	784	783	782	779	774	770	766

DIAGRAM II.

*Final corrected Employment Curves for Certain Industries.**(Logarithmic scale. One vertical division represents 25 per cent. change.)*

strikes of July, 1923, and February, 1924; the building-trade lock-out in the summer of 1924; the wool industry strike in July, 1925; and the engine-drivers' strike, affecting primarily the heavy industries, of January, 1924. Among legislative factors affecting the industries examined we may note the subsidies granted to the building industry—the "Chamberlain" subsidy of April, 1923, and the "Wheatley" subsidy of July, 1921—and also the reduction of the subsidy in September, 1927. The effects of this latter were very clearly marked. Also there was the coal industry subsidy of August, 1925, to April, 1926, whose benefits appear from the employment curves to have been largely diffused over the iron and steel and metal industries. A slight effect is observed on the motor industry of the brief suspension of the McKenna Duties (June, 1924–July, 1925). The sudden downward movement, in many cases only temporary, in many of the exporting industries in May, 1925, is often attributed to the return to the gold standard. In most cases, however, the downward movement began at the beginning of 1925.

During 1928 contraction or stagnation was almost universal. In very few industries was there an expansion of employment. Judged by this count the situation is now more ominous than it was in 1925; but employment is not displaying a wholesale collapse as it did in 1921.

It is hoped that the result of this and similar investigations will be to provide some basis of fact for study of both the particular and the general aspects of the economic changes which are going on at this moment. With the exception of one or two industries, output figures are only available at very long intervals. An employment index, if purged of the large numbers of errors which enter from the nature of the data, should provide us with a classified monthly record of industrial turnover. It should enable us to make inductive analyses of economic activity from the supply side in relation to various factors. The next step which seems to be suggested is to relate these data to the available population figures, and compile some approximate record, for intercensal years, of the economic activities of the whole population. Also it should be possible to relate the employment index for certain industries and groups of industries to production indexes, especially to the Board of Trade indexes for particular industries as they become available. More far-reaching is the possibility of relating these data to cost and price indexes. We could obtain some idea of the effect on the activity of different industries of changes in particular costs such as those of labour, transport, and fuel concerning which reliable data are readily obtainable. These extremely ambitious objectives, however, were not the motive with which this investigation was undertaken, which was begun with the hope of throwing some light on the problem of unemployment.

I am grateful to Professor A. L. Bowley, of the London School of Economics, for assistance in preparing this paper for publication; and also to Professor D. H. Macgregor and Mr. L. C. Robbins of Oxford, without whose encouragement and sympathy the exceedingly laborious early stages of this work would never have been completed.

APPENDIX.

As described in the text, the administrative changes of 1922, 1924 and 1927 introduced changes officially estimated at 50,000, 70,000, 25,000 respectively. It was required to distribute these estimates among the various industrial classifications. In the first case the insured population for Southern Ireland under each head was known. The 50,000 was distributed so that the amount subtracted from each industry was proportional to the product of the percentage rate of unemployment at that date in the United Kingdom for that industry, and of its insured population in Southern Ireland.

A similar method was possible for the change in 1927, as the number of workers between 65 and 70 in each industry in July, 1927, was published.

The 70,000 in 1924 was distributed so that the deduction for each industry was proportional to the number of hours of short time lost in that industry, recorded by the Industrial Census of 1924.

As an example of the disturbance in the figures caused by the legislative change, and the estimated correction, the figures for the clothing industry are plotted in the inset to Diagram III (seasonal and other corrections already applied).

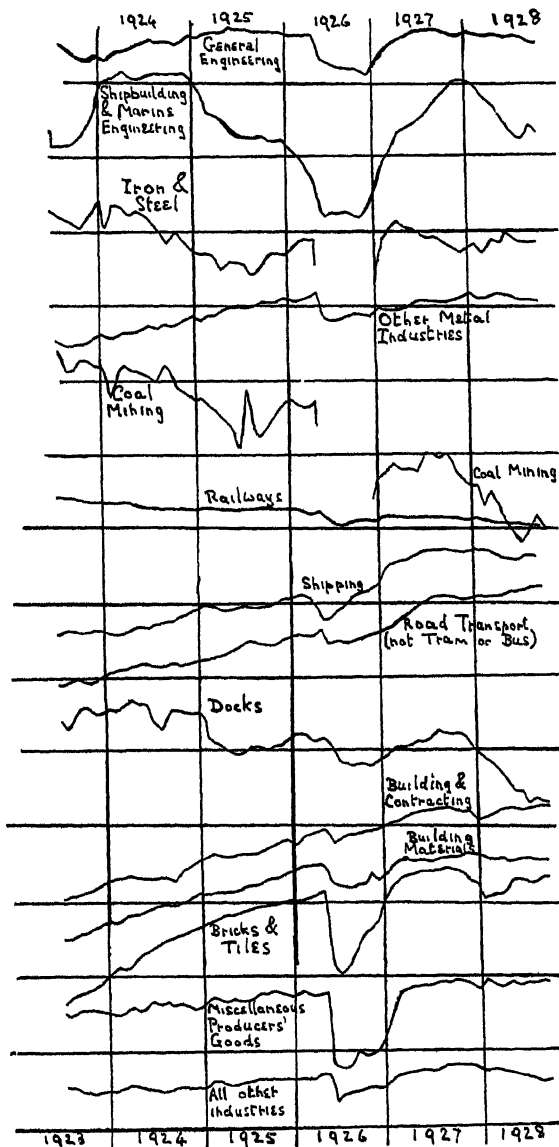
The table of suggested percentage additions to recorded unemployment, in order to cover short time, is as follows:—

Silk	58
Miscellaneous Textiles	24
Textile Finishing	59
Iron and Steel	0
Engineering	5
Shipbuilding	15
Miscellaneous Metal	17
Clothing	76
Miscellaneous Finishing Industries	30
Food, Drink and Tobacco	29
Printing	22
Public Utilities	4
Building	12
Local Government Services	28
Other industries	29

TABLE V.
Final corrected Employment Figures for certain Industries, by Quarters, June, 1923—September, 1928 (figures in thousands).

Year End of month	1923.			1924.			1925.			1926.			1927.			1928.		
	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.	Dec.	Mar.	June.	Sept.
General and Railway																		
Engineering	598	631	578	586	598	601	610	619	623	620	620	611	563	551	566	604	604	593
Shipbuilding	178	182	215	224	216	221	219	198	188	189	182	169	146	147	167	207	186	187
Iron and Steel	287	276	206	292	284	261	287	252	247	243	253	265	143	164	204	266	266	266
Other Metal Indus-																		
tries	330	327	338	339	344	346	356	358	364	370	375	377	360	368	365	366	374	376
Railways	595	590	586	582	577	575	574	578	572	571	571	567	543	550	557	568	566	552
Shipping	94.8	94.9	95.5	95.7	96.7	98.1	101.1	103.0	101.8	103.0	104.9	105.6	97.8	106.1	108.1	117.1	120.8	119.3
Road Transport (not																		
Tram or Bus)	120	122.5	124	126.5	128	128	129	131	135.5	135.5	139	138.5	137	137.5	148.5	150.5	156	162
Docks ... and Con-	144	150	149	136	144	149.5	149	133	132.5	132	138	136.5	127.5	127	130	123	136	136
tracting	690	714	739	742	741	757	786	788	797	814	814	844	826	842	861	884	901	906
Miscellaneous Build-																		
ing Materials	182	154	160	162.5	166.5	168	178	173	175.5	180	184	188	175	176	185	190	188	189.5
Brick and Tile	56.6	58.0	61.2	63.9	66.4	68.1	70.4	72.0	78.9	74.8	75.6	76.8	60.1	67.3	76.5	80.9	82.3	78.4
Miscellaneous Pro-																		
ducer's Goods	149.5	151	150	151.5	155	153.5	162	155.5	166	160	157	158.5	156.5	151.5	141.5	161	164	163
Pottery	57.5	59.0	59.2	56.1	61.4	61.1	60.8	57.7	56.3	56.7	55.0	57.8	55.0	44.1	50.0	59.8	56.3	51.1
All other Industries ...	424	419	419	424	420	424	425	423	451	435	436	439	413	425	454	446	445	435

DIAGRAM III.

*Final corrected Employment Curves for Certain Industries.**(Logarithmic scale. One vertical division represents a 25 per cent. change.)*

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Statistique mathématique*. Par G. Darmois. 363 pp. Paris : Gaston Doin, 1928. Price 32 frs.

This book, to which M. Huber, of the Statistique générale, has contributed a good preface, covers the field in the following order. The first three chapters deal with the elements of the mathematical theory of probability and, at an early stage, the notion of a generating function of the moments of a "law" of probability is introduced and it is usefully applied throughout the book. To English readers familiar with Mr. Soper's admirable tract on Frequency Arrays (which might well have been included in Professor Darmois' bibliography) this will be a welcome feature. The reviewer has long been of the opinion that the method of generating functions as extended by Macmahon in his classical treatise on Combinatory Analysis should be of immense value in theoretical statistics; but, unfortunately, highly trained mathematical statisticians—and only highly trained mathematicians could handle so delicate an instrument—have so far not been interested in the matter. The next two chapters deal with the description of observations and cover a surprising amount of ground. Chapters 6, 7, 8 and 9 are upon correlation and, rightly, betray in almost every line the influence of Tschuprow. They are well done but do not, perhaps, add much to what can be learned by the student from Tschuprow's little treatise. Chapter 10 is devoted

to the "normal" law, and the last chapter is mainly concerned with problems of interpreting co-variation of secular series, which have been treated in this *Journal* by Mr. Yule and Dr. Anderson.

In the reviewer's opinion this is an excellent treatise to put into the hands of statistical students with a fair grounding in mathematics who are also doing laboratory work. It might also be useful to young mathematicians who wish to have some idea of what statistics is about.

M. G.

2.—*Statistical Methods for Research Workers.* By R. A. Fisher, Sc.D. 2nd edition. 266 pp. Edinburgh: Oliver and Boyd, 1928. Price 15s. net.

The reviewer of the first edition of this book in the *Journal* (1926, Part I, p. 144) remarked that it would prove a hard nut to crack for biologists who attempted to use it as a first introduction to statistical method. We would go further and say that it is a hard nut to crack for the average mathematical statistician, perhaps more so than for the biologist, who will take much for granted that the former will find himself impelled, almost exasperatingly, to investigate. However, if he perseveres with the nut, he will find his teeth very much sharpened in the process, for he will have consulted a number of fascinating mathematico-statistical papers in which are presented the author's contributions to statistical theory, contributions which, in our opinion, have already had, and are still more likely to have in the future, a far-reaching influence on the subject.

The author's hope "that use would be made of a book which, without entering into the mathematical theory of statistical methods" (by which he means "gives no proofs"), "should embody the latest results of that theory, presenting them in the form of practical procedures appropriate to those types of data with which research workers are actually concerned," would seem to have been justified by the early demand for a new edition. Since nearly all of the subject-matter of the first edition was ably dealt with by the statistician who reviewed it, only a few remarks will be made here on the chapters on analysis of variance and the new features of the second edition.

Dr. Fisher introduces us to the analysis of variance by means of the subject of intra-class correlations, which is a special case of it; the testing of the significance of the difference between the variances within and between classes is here utilized to help the reader towards the more general conception of testing the significance of the difference between any two estimates of variance calculated from given degrees of freedom. The function z employed in this test is half the logarithm of the difference between the two estimates of variance, and having discovered the frequency distribution of this function *for any size of sample*, the author has made it available for practical work by tabulating the *one and five per cent. points* of the distribution of z for values of n_1 and n_2 , the respective degrees of freedom of the two estimates of variance. This means that instead of having the probabilities of given values of z , we are given the values of z

which, on the hypothesis tested, would only be exceeded by chance respectively once in a hundred and once in twenty times. While sufficient for significance tests this makes possible a great saving in tabulation, and the second edition contains a greatly extended table of the five per cent. points and a new table of the one per cent. points.

The object of the analysis of variance is to subdivide the observed variance of a variable quantity into portions ascribable to definite causes, together with a certain residual variance which is accounted for by chance factors or, as we may say, "experimental error," and which in a well-designed experiment should be small. The different variances, when obtained, have to be submitted to a test of significance to determine whether they are significantly greater than this residual variance, and this gives the author an opportunity of using his favourite method of degrees of freedom and the theory of small samples in whose development he played so conspicuous a part. As an example, the variance of a series of crop yields may be split up into variances which represent different manures, treatment, varieties, etc., together with a residual variance due to the remaining "chance" factors. In dealing with crop yields it is important to eliminate soil heterogeneity by suitable randomization of plots, and the author shows several ways of doing this, notably the Latin Square arrangement in which the experimental plots are arranged in the form of a square, and the treatments (*e.g.* differences of manuring) are replicated, but arranged so that only one appears in each column and row.

Some slight obscurity is caused in this chapter by the almost undefined use of certain semi-technical terms whose meaning is set down here in the hope that it may be of use to others:—

(1) p. 235. "*Equalizing the Distribution (of Treatments) over different blocks (of land).*" This means using the same number of treatments in each block.

(2) "*Balancing the Treatments in each block.*" This means that if there are r blocks and s treatments, each treatment occurring once in each block, and if treatment k occupies a position in the m th block whose order (1st or 2nd or 3rd, etc.) is given by t_{km} , then

$\sum_{m=1}^{m=r} t_{k,m}$ is the same for all values of k .

(3) "*Completely equalized in respect to order in the block.*" This means that each treatment occurs once in each block and in each position in an equal number of blocks. If this occurs, the treatment is as a necessary consequence "balanced" according to definition (2).

In the second edition there is a useful new section on the calculation of the polynomial values of a fitted regression line and a new chapter on the "Theory of Statistical Estimation" in which a particular Mendelian problem affords an admirable illustration of the author's theory of efficiency, of the determination of efficient statistics by the method of maximum likelihood (which must give an efficient statistic where one exists), and of the dangers of using inefficient statistics. This is a very important chapter, and will have a wide appeal among mathematical statisticians; for this reason it is perhaps a pity that a little space was not devoted to the definition of the

Mendelian terms used, for the benefit of statisticians who, unlike the author, may not have genetic theory at their finger-tips.

In conclusion, this is a book which neither the biological nor the mathematical statistician can afford to neglect, but, reverting to the metaphor of the nut, the latter must use a good pair of nut-crackers and the former, assuming the crackers to be provided for him, must use a Gladstonian amount of mastication. An attempt to swallow it whole, or to eat it too quickly, will result in the most painful forms of indigestion.

J. O. I.

3.—*Population Statistics and their Compilation.* By Hugh H. Wolfenden (and others). Actuarial Studies, No. 3. 144 pp. Published by the Actuarial Society of America, New York, 1925.

This book is one of a series of monographs dealing with subjects of actuarial interest published by the Actuarial Society of America. It gives in outline information about the way censuses are taken in various countries and the sources from which information can be obtained as to births, deaths and marriages, discussing briefly but satisfactorily the relative advantages of the "de facto" and the "de jure" methods, quoting in this connection from the recommendations made by the Statistical Society in considering the plans for the 1921 census of the United Kingdom. The author then proceeds to discuss the reliability of the censuses and statistics and the nature of the errors therein, and having thus given an account of the data and the way they are obtained, he explains how adjustments are made for errors of age and the various methods adopted for making estimates of population between censuses or thereafter. The next step is to discuss the mathematical relationships between births, deaths and populations and the formulæ for the rates of mortality. We then come to the construction of mortality tables from population statistics, comparison of mortality in various communities, occupational mortality, etc., and finally a short chapter on sickness data.

The principle on which the book is prepared seems to be to give a reference as far as possible to any established method or any recent suggestion that may have been made in connection with the various subjects discussed. The objection to such an arrangement is that certain suggestions that have never yet been used in practical work, although they may be ingenious and helpful, receive undue prominence. This is probably unavoidable to some extent when an author is aiming at giving complete notes within a small compass, and it is the latter difficulty probably that has led to the exclusion of numerical examples in connection with the estimates of population—pp. 57–70. The important point about estimates of an intercensal population is not the theory upon which the particular formula is based, but whether the arithmetical result, when obtained, is reasonable for the purpose for which it is wanted, and if the simplest hypothesis gives a sufficiently accurate result it is unnecessary to complicate the issue by any other assumption. If, for instance, the hypothesis that population increases between censuses in arithmetical progression in every age group does not mis-state the

result to an important extent, no useful purpose is served by anything more complicated, and in dealing with this part of the subject a series of numerical examples is wanted where rival methods are compared arithmetically.

The book, very properly, explains that mortality tables cannot be constructed from death returns only or from census returns only, and in a long footnote to p. 86 it contains a criticism, with which we agree, of Arne Fisher's recent attempt to obtain a life table by means of curves based on causes of death.

Allowing for its point of view and range the book is well done and satisfactory, and will be found of considerable help to those who want an abridged statement of the subject, but it will probably be more useful to those who have already studied the subject than to those approaching it for the first time, mainly because it calls the reader's attention to many methods instead of confining it to broad principles. It should also prove useful to those who have worked up the subject for examination purposes and wish to have a complete notebook for revision.

An important matter that will have to be included in future editions is the subject of estimating future rates of mortality in a community. This is barely touched on in the volume before us, but it appears to be of growing interest.

We may also suggest that consistent treatment should be adopted with regard to the names of the various people to whom reference is made. Some of them are referred to merely by name and initials—probably the best way—but every now and then one finds Dr. or Mr. or Professor inserted for no particular reason.

The book is not indexed, but the table of contents at the beginning of the book is so full that there is little difficulty in referring to any point of interest.

W. P. F.

4.—*Statistical Laws of Demand and Supply, with special application to Sugar.* By Henry Schultz, Professor of Economics, University of Chicago. xix + 228 pp. University of Chicago Press, 1928. Price 15s. net.

Professor Schultz begins by emphasizing the insufficiency of current expositions of the theory of price equilibrium in the face of modern conditions. "In order to bring the general theory of equilibrium into closer agreement with the facts of our economic experience, it is necessary to pass from a static equilibrium to a moving equilibrium. The problem has two aspects: the purely deductive or mathematical, and the statistical. The first has not as yet been successfully studied, although the signs point to the possibility of a development of a mathematical theory of dynamical economics in the next few decades. The second has recently been solved by Professor Henry Moore of Columbia University, who was also the first to derive statistical laws of demand and supply in his paper on 'A Theory of Economic Oscillations.'" It is the object of the present work to examine some of the difficulties which arise in the derivation of statistical laws of demand and supply, to indicate how these

difficulties may be overcome, and, by way of illustration, to derive the demand and supply curves for sugar, to show how the equilibrium of demand and supply changes from time to time, and to indicate the bearing of the results on the tariff on sugar.

In mathematical symbols the statistical law of demand is :

$$x_0 = F(x_1 x_2 x_3 \dots x_n t)$$

when x_0 and x_1 are respectively the price and quantity of the commodity in question, $x_2 x_3 \dots x_n$ are the prices of all other commodities and t is the time. If we give t a fixed value t_0 , we obtain the Walrasian static law of demand as a special case, and if we also give constant values to all the x 's except x_0 and x_1 , we obtain the neo-classical law of demand as another special case. If we eliminate time changes by reducing quantities to a *per capita* basis and prices to a constant purchasing power basis, and then express the adjusted figures as link relatives or trend relatives, the dynamic statistical law of demand becomes :

$$X_0 = \phi(X_1 X_2 X_3 \dots X_n)$$

Assuming that X_0 may be expressed as a simple linear or parabolic function of the X 's, the adjusted figures may be tested by any statistical methods that seem appropriate, including the method of multiple correlation. Difficulties were, however, experienced with the last-named device and the results obtained were not satisfactory.

In the background of the author's reasoning lies the hypothesis that price movements in a closed economic system tend to be periodic, and that under these conditions the coefficients of elasticity of normal demand and supply tend to numerical equality. There seems room for the development of this side of the problem by means of a differential equation, but this Professor Schultz has not attempted.

Owing to inadequacy of data it is not possible to take a large number of variables into account, and Professor Schultz's most successful experiments have been the results of plotting relative changes in the annual consumption (production) of sugar against relative changes in average annual market price on a scatter diagram and relating the two variables by means of a linear equation determined so as to minimize the squares of the normals. Prices are correlated with current consumption on the demand side and with next year's production on the supply side. This method expresses the total elasticity of the commodity as a linear function of the quantity consumed (or produced). "Normal Elasticity" is then referred to periods of normal demand (or supply).

Passing over much experimentation the coefficient of normal elasticity of the world demand for sugar is found to be -0.6 , a figure that does not show any significant numerical difference from the coefficient of normal supply. A final section is devoted to practical applications of the theory to the tariff problem. The whole plan is ingenious and well-thought-out and there is a decided case for further investigation on similar lines. There are, however, a few points of criticism.

(1) The data are not sufficiently numerous, and probable errors are large, especially where more than two variables are in question.

(2) The coefficients obtained are unduly sensitive, especially to the adoption of particular mathematical devices.

(3) Further enquiry is needed into the precise effect of correlating deviations from smoothed curves that are not statistically independent of the original observations. May not this procedure introduce "nonsense correlations," especially when the periodic character of the figures is taken into consideration?

It is noteworthy that the results obtained by simple mathematical functions are in general superior to those obtained by more complicated functions, and that the former methods less frequently lead to absurdities. Economic statisticians should take this to heart.

L. R. (1.

5.—*Studies in Deceit*. By Hugh Hartshorne and Mark A. May. Book I. 414 pp. Book II. 306 pp. New York and London: Macmillan Co. 1928. Price 20s. net.

In 1924, at the request of the Institute of Social and Religious Research, an enquiry into character education with particular reference to religious education was undertaken by Teachers' College, Columbia University. Dr. Hartshorne (Professor of Religious Education at the University of Southern California) and Dr. May (Professor of Psychology at Syracuse University) were appointed directors of the investigation. This book is the first result of their labours. It details the development of what the authors describe as a "large battery of deception tests" which they applied to 11,000 school-children in ordinary class-room situations, in athletic contests, in parties, and in work done at home. The results obtained were then related to many other factors, ranging from cultural limitations to frequency of attendance at the "movies" or from heredity to emotional instability. No one can complain that the description of the methods used and of the material acquired is insufficiently detailed, or that the statistical treatment of the data has not been sufficiently laborious. Every point is set out with the utmost liberality. Possibly the psychologist will derive great profit from it; the statistician, it seems to the reviewer, will more probably be left bewildered and unable to escape from the question, "Has it all been worth while?" Are we very much wiser either as to character or the effects of religious education when we know that many children, when given an arithmetical test to do without looking at the answers, take advantage of their possession of the answers to increase their score? or that most children endeavouring to "stick on the donkey's tail" at a Christmas party with their eyes shut do not quite rigidly observe the law? Education of any kind might have very little effect on such malpractices of child life; whether it has "long-distance" effect on character is quite another matter. Or, again, one is not sure whether the *immediate* character is measured at all by such means. From general recollections and impressions one would be inclined to say that most children pass through temporary phases of lying and

even stealing (on a minor scale), while as for class-room cheating the normal English public school attitude would certainly be "all's fair in love and war." Only prigs would fail to take advantage of a short-sighted French master.

The conclusion on p. 329 seems to the reviewer's memory a little cautious. "The hypothesis may be entertained, then, that a subtle difference between teachers exists, even when all are working consciously and skilfully along progressive lines, and that this difference is occasionally large enough to account for wide differences in deceptive behaviour." One is able to recall cases where the differences were not so subtle. With one master even the boldest dared not cheat; with another it would be difficult to find one who did not.

Some of the tests and their results seem to be merely ludicrous, and others, in a sense, grossly unfair. For instance, having discovered that a child cheated, is it reasonable to class him as a liar because he denies cheating? or is any measure of untruthfulness secured by asking children 72 questions, such as "Did you ever say anything about your teacher that you would be unwilling to say to her face?" "When you see other children fighting, do you stop them?" and "Do you spend some time each day acquiring a liking or taste for good music, fine art, and good literature?"

The argument is that any child who replies "yes" to a certain number of these questions is a liar!

An example of the ludicrous may be given in the "effect on deception of the mention of Deity." To four groups of children six tests were administered; the first two tests were given without comment, the second two with the comment "Honesty is the best policy," and the last two with the comment, "God loves an honest man." The result is that the children who have religious teaching every week get "progressively more honest as the idea of honesty and then the idea of God in association with the idea of honesty are introduced, whereas the children of the same class-room who do not attend religious school get progressively less honest under the same circumstances." How hardened is the ungodly in his wickedness! It is admitted that the number of cases is too small for reliable conclusions, but the test is reported as "suggestive of the kind of experiment that might easily be conducted to discover the values for conduct that inhere in various customary forms of control."

A wise parent will not put this book into the hands of his offspring. For how can he correct Tommy's dishonesty if Tommy can quote p. 409, that "deceit is associated with such factors as parental discord, parental example, bad discipline, unsocial attitude toward the children"; and p. 410, that "deception runs in families to about the same extent as eye colour, length of forearm, and other inherited structures" . . . and "the general drift of evidence inclines one to believe that, if all children received identical nurture, they would still vary in deception"? Let the father first cast out the beam from his own eye.

A. B. H.

6.—*Twin Births and Twins from a hereditary point of view.* By Gunnar Dahlberg. 295 + 85 pp. Stockholm: Bokförlags A. B. Tidens Tryckeri, 1926.

The original aim of the author of this book was to throw some light on the heredity of disease by investigating the diseases of monozygotic twins, but he found himself led to replace this by a general study from the point of view of heredity, first of the occurrence of twin births and then of the characteristics and resemblances of twins. In Part I from a survey of previous work amplified by new material from both official and private records he deduces the following main conclusions. Multiple births on the whole follow Hellin's law by which twin births occur in $1/n$ of all births, triplets in $1/n^2$, quadruples in $1/n^3$ and so on, n varying between 80 and 90. The proportion of monozygotic births can be roughly estimated by Weinberg's rule that the number of dizygotic pairs is equal to double the number of opposite sexed pairs; this makes the monozygotics about 20 to 30 per cent. of all twins. Twin frequency—dizygotic decidedly and monozygotic hardly perceptibly—rises with the mother's age to a maximum at about age 37 and then declines. For the influence of birth order apart from mother's age there is little evidence; the author also finds no support for the theories of connection between twinning and various forms of degeneracy, nor for any argument from analogy in the human case with those of lower animals in which doubling can be produced experimentally by abnormal environmental conditions of the egg. Heredity of the tendency to bear dizygotic twins has been distinctly shown in the case of the mother, racial factors appear to exist, and artificial differences in frequency also arise from differences in the registration of still-births, as the still-birth rate is higher among twins than among single births, and higher in monozygotic than in dizygotic twins. Dahlberg then moulds these facts into a provisional working hypothesis by which monozygotic twinning is due to an hereditary disposition to double formation in either the egg or the sperm. Dizygotic twinning is due to the egg only, and may arise from the same hereditary disposition to double as monozygotic, or it may arise purely by chance by the liberation and fertilization of two eggs at about the same time. In the case of the female disposition to double, the deciding factor as to di- or mono-zygotism is simply the time at which the doubling takes place, whether before or after the reducing division. All transitional stages between independent monozygotic twins and more or less conjoined twins, are on this theory due to the varying times at which the doubling takes place—the earlier the more independent. This requires that the same families should inherit the tendency to monozygotic and dizygotic twinning, and the author gives some new data on the repetition of twinning on Swedish mothers which, though not extensive, do suggest excess tendency in mothers of dizygotic twins also to bear monozygotic twins. A chapter is included on Mendelian inheritance and the way in which the proportions of hetero- and homozygotes bearing a Mendelian character under different simple assumptions "mendle forth," as the author puts it.

By Dahlberg's theory, however, twinning diverges from simple Mendelism.

Part II deals with the characteristics of twins themselves, but is too full of detail to lend itself to summarization. It is based on information about 1,115 pairs of twins from Sweden. On 243 pairs of these bodily measurements and other characters were obtained, and are given in full. Diagnosis of monozygotes was made by likeness in the shape of the ear, and in finger-prints, as well as in general likeness so close as to cause confusion. By comparison of the differences and their standard deviations in measurements of the same person, brothers, monozygotic twins and dizygotics of the same and opposite sex, estimates are made of the relative size of errors of measurement, and deviations due to environment, heredity and sex. Pathological data were sought, but the results were too scanty to give any general conclusions. The Appendix gives a collection of photographs, full-face and profile, of both types of twins, also of pairs of like and unlike ears. There is also a comprehensive bibliography. The author is at one with Galton in that his subjective impression was that though monozygotic twins are closely alike both in bodily form and intellectual ability, they often differ strikingly in temperament and emotional reaction. The book will serve as a useful and suggestive guide for further study of heredity in twinning and twins. E. M. N.

7.—*Report of the Committee on Vaccination. Ministry of Health.* Printed and published by His Majesty's Stationery Office, London. July 1928. Cmd. 3148. Price 7s. net.

This volume also includes the two Andrewes Committee Reports, a commentary thereon, special studies, and eighteen Appendices. It thus gives the results of work by two Committees of experts, and a kind Fate most happily determined that those Committees in both instances should be presided over by chairmen exceptionally qualified to appraise the value of evidence. The recommendations of the second Committee raise important administrative problems, but it seems desirable here to direct consideration more particularly to the fundamental statistical question: Was the apparent "overlapping between vaccination and encephalitis" (observed in certain groups of cases) "merely fortuitous?"

The Andrewes Committee, in the first instance, consulted Professor Greenwood, who expressed (p. 102) a guarded opinion, to the effect that the fatal incidence of nervous disease then in question (seven deaths) was "somewhat higher on recently vaccinated and revaccinated children than on the general population of the same age," and that this total excess over expected was "moderately improbable." The Committee then entered upon an intensive study of thirteen "cases of encephalitis" in the counties of Gloucester and Worcester. An important footnote on p. 98 tells us, "These cases have been alluded to as 'encephalitis' as a general term, but it is by no means clear that they were all of that nature—cases of 'nervous disease' following vaccination would probably be more correct." Here we are faced at once with the difficulty of obtaining information,

concerning cases of "nervous disease" generally, in a "control population"; as the second Committee remark (p. 169), "notice of the post-vaccinal cases was obtained by careful special enquiry"; no similar enquiry was made in the control population. On pp. 102, 119 and 170 attempts are made to grapple with this difficulty. A population of 300,000 children (0-14) is compared with one of 10,000 recently vaccinated children of ages 1-15. But it transpires that the age distribution in the two groups is very dissimilar, and this is important, for the various forms of "encephalitis" are markedly selective as regards age-incidence. More serious is the fact that while all cases of "encephalitis" (as defined in footnote on p. 98) are included in the "post-vaccinal cases obtained by special enquiry," poliomyelitis and polioencephalitis only are mentioned in dealing with the control population on p. 119; and though on p. 170 addition is made of cases of "encephalitis lethargica," in neither instance are figures given for the control population as to "other acute nervous disease." Nevertheless, as a matter of fact, the majority of the thirteen "post-vaccinal cases" are shown (Table on pp. 129-144) to belong to one or other category which might be described as "other acute nervous disease" and only two of them are definitely assigned to "encephalitis lethargica." These facts need to be carefully weighed in assessing the value of the evidence passed under review in the Reports against a theory of "fortuitous overlapping."

The Andrewes Committee discusses another difficult question, that of the so-called "incubation period" (a misleading term, as they point out). On p. 120 they insist that "the constancy of the so-called incubation period of the encephalitis cases may be more apparent than real." This observation will appeal to anyone who has tried to fix the precise time of commencement of illness in such cases, and the second Committee refer to the point on p. 149, and discuss the whole question in further detail on pp. 173-5. The two Committees agree (the former with one dissentient) that vaccinia cannot be held solely responsible for the nervous sequelæ. An "hypothesis of combined virus action" is discussed by both Committees; the second Committee feels it extremely difficult "to evaluate the hypothesis" any more than did its predecessor. The theory of the possible existence of "known or unknown neurotropic viruses harboured by individuals" is also adumbrated and discussed. Readers of Sydenham and the "annalists" may fancy they have heard of something of this kind before. The facts and theories so intriguingly referred to in this connection by the two Committees have clearly, however, far wider epidemiological relationships than those which form the immediate subject of the two Committees' enquiries. The Report stimulates further investigation, both pathological and epidemiological.

W. H. H.

8.—*The Economics of Rail Transport in Great Britain.* By C. E. R. Sherrington. With a Foreword by Sir Guy Granet, G.B.E. 2 vols. London: Arnold. Price 12s. 6d. each vol.

Mr. Sherrington has written a valuable book, which covers railway

working of all kinds in Great Britain, and includes some hints derived from the working of American railways. After an historical survey describing how the early railways (originally local lines) were gradually combined until they formed one "nationalized" system, Mr. Sherrington criticizes rather sharply the changing policy of Parliament towards railways. At one time it favoured amalgamation, then it preferred competition, and finally forced amalgamation in 1921 without facing some real difficulties. Thus the savings to be gained through grouping were "grossly over-estimated," and the difficult problem of traders' wagons was studiously avoided. Having considerable experience of railway working on both sides of the Atlantic, Mr. Sherrington does not feel called upon to endorse most of the criticisms directed against our railways; it is generally admitted, he says, "that in questions of permanent way construction and maintenance the British railways are pre-eminent," and the same may be said of British steam locomotive design. Again, it is "doubtful if any country can offer more comfortable accommodation for the lowest class of passenger."

One of the most debatable questions in English railway working is the optimum size of goods wagons. Mr. Sherrington calls the eight-ton open truck, so popular on many British railways, "a luxury wagon," but the trader prefers it and is willing to pay a higher rate than would be required with a larger truck. Freight traffic in this country is essentially different from that in other countries because of the short haul and the fast and frequent service demanded by traders. Mr. Sherrington thinks that the twenty-ton wagon is too large for our special kind of trade; he prefers one carrying from twelve to fifteen tons. He makes some attempt to deal with another difficult problem, the expenditure to be debited to freight and passenger traffic respectively, but gives it up as insoluble. Rate-fixing is another difficult subject, which is very fairly discussed; the author observes that the tapering scale now operates regardless of railway frontiers, one of the few real advantages of amalgamation; the "common user" of wagons is another, because it means economy of empty haulage.

In a time of depression like the present, railway managers have many difficulties to face. They cannot cut down working expenses when traffics fall; Mr. Sherrington reckons that 85 per cent. of the expenditure is "for all practical purposes fixed." Thus maintenance and renewal of way and works take 12 per cent. of the annual traffic receipts; rolling stock takes a further 15 or 16 per cent. Then locomotive running expenses take 20 or 21 per cent.; a small saving is possible here, *e.g.* if coal traffic falls. Something may be saved, too, in "traffic expenses," which take 29 per cent.; but there is no margin in the 7 per cent. for general and law charges, including health and unemployment insurance. In 1914 the operating ratio was 65 per cent.; during Government control it rose above 100 per cent. It is, he holds, to the shocking neglect of business principles during the control period that the financial troubles of the railway companies are mainly due. Nevertheless, Mr. Sherrington believes that the

capitalization of our railways is stronger than that of American railways, because we have only 34 per cent. of loans and debentures, while the figure in the United States runs up to 55 per cent.

Mr. Sherrington writes strongly about the value of statistics as a measure of the efficiency of railway working. He finds several faults in the statutory returns given in the companies' annual reports, and he thinks that America is ahead of us in the use of statistics. He regrets our failure to use the gross ton-mile, whereas the United States have developed the gross ton-mile per train-hour unit with great success. In fact the unit is very important. Some authorities prefer "cost per train mile"; Mr. Sherrington thinks it a poor statistical unit because it takes no account of gradients; the train-mile per engine-hour, and per train-hour, is useful. Among other facts we note that 40 lbs. of coals will drag a 430-ton express one mile; it costs 3s. 6d. to stop and start a passenger train, 5s. 6d. to stop and start a heavy mineral train.

Turning to the railway manager's latest worry—road competition—Mr. Sherrington points out that the real danger of road transport, which "scrapes away the cream of well-paying traffic and leaves to the railways the most difficult and costly to handle," is that the basic industries may be "charged out of existence." He recognizes that the road vehicle is enabled to compete in rates and fares with the railways because "it pays only part of the cost of maintenance for its permanent way, and no interest upon the original capital sunk in its construction"; it is also free from rules imposed on the railways. In fact, road transport is a *subsidized* industry, and our author thinks that the subsidy may mean that "the road haulier is transporting goods and passengers at a point below the actual cost of service." No doubt the road vehicle pays a licence duty, and a light-spirit duty too, if it uses petrol; Mr. Sherrington misses one important point—the low scale of licence duties paid by commercial vehicles. A 15-cwt. van pays £16 a year, a 150-cwt. van pays only £60; there is now a 20 per cent. rebate for rubber-tyred vehicles. The reviewer holds that the heavier vehicles ought to pay more per ton than the lighter vehicles; but the House of Commons has sanctioned a graduated scale of taxation which ceases to advance after five tons! In land transport the main expense is the provision of the permanent way, not the cost of dragging a vehicle along it. But the motor vehicle, unlike the train, pays only a small part of its real working cost; that is why it can compete with the train. Mr. Sherrington warns the public that it cannot have both railway and road services if railways do not pay.

J. E. A.

9.—*Industrial Tyneside*. By Henry A. Moss, B.A., Ph.D. 184 pp. London: Ernest Benn, Ltd., 1928. Price 10s. 6d. net.

In 1924 the industrial depression and the social evils apparent in the towns bordering upon the Tyne led a group of men and women to consider what service they might render. It was determined that a truthful and comprehensive survey of the facts was the first

requisite. Until these were accurately determined the best course of action would remain in doubt. A Bureau of Social Research for Tyneside was set up in the autumn of 1925, and Dr. Henry Mess was appointed director. This extremely interesting book is the result of his labours. It sets out clearly the chief facts concerning the welfare of the inhabitants of the industrial area along the River Tyne, and concludes with some recommendations towards easing the present deplorable condition of the district.

The survey differs from others such as Rowntree's study of York or Bowley's studies of poverty. These gave a picture of the conditions found in certain towns in a particular year, the details being mainly compiled from house-to-house enquiries. The aim in this case has been to study the area as it has changed over a period of about a century, and to show thus the forces which have shaped and are shaping its life. Laborious personal investigation was beyond the means of the Bureau, and the facts have been obtained in the main by piecing together information already existing in numbers of official and unofficial reports but never previously assembled and analysed. Local knowledge has, however, very considerably added to and checked the information gained from these sources.

Coal and a tidal river are the *raison d'être* of urban Tyneside. It was mainly the development of collieries in the early part of the nineteenth century and of shipyards in the latter half that led to the phenomenal increase of its population. Towns grew at an amazing rate. In the county of Durham, over the decade 1861-71 the inward balance of migration amounted to no less than 150 per 1,000 inhabitants of the county at the beginning of the decade. Villages became towns through the operations of a single firm, e.g. modern Jarrow sprang into existence with the opening of Sir Charles Palmer's shipyard in 1851. The price of land soared and the towns grew up cramped and congested. Yet this is felt to be only one of the derivations of the exceptional overcrowding in the district. In eleven out of the thirteen Tyneside areas over 30 per cent. of the population were living in "overcrowded conditions" in 1921 (according to the 1921 Census definition of more than two persons to the room). In London only two areas, Finsbury and Shoreditch, reach this figure, and in other parts of England and Wales (excluding Durham and Northumberland) no examples are to be found. Dr. Mess agrees with Bowley and Burnett-Hurst that the free colliery house is a factor. "If a worker is offered a rent-free house and refuses to accept it, he loses his right to the customary allowance for the rent of the house which he does take, and therefore is under a very strong inducement to occupy a rent-free house if one is vacant, however unsuitable, insanitary or inadequate to the size of his family it may be" (*Livelihood and Poverty*, pp. 22-23). It should be added that most colliery houses are inadequate. In addition, when the great expansion of population took place upon Tyneside it was catered for very largely by the building of the "Newcastle flat," a form of housing not allowing much variety and setting a somewhat low standard of house-room. Another factor is that the area is one of

early marriages and high birth-rate, both cause and effect of overcrowding.

Dr. Mess has no doubt that the greatest obstacle to be removed in improving housing conditions is the custom and habit of mind which has been established. "The small and congested home is accepted as a matter of course in this corner of England to a degree greater than elsewhere," and "reasons of a purely economic nature are not by themselves an adequate explanation" (p. 87).

The vicissitudes of industry have been striking. "Time after time it has seemed as if a term had come to the prosperity of the river; but as one industry or one market has failed, another has risen to take its place" (p. 37). The post-war slump is the steepest on record, but it is no new phenomenon. A study of the Tyneside industries shows how precarious was the pre-war position. It was largely based upon a few great industries, upon the demands of foreign countries, and upon the race in armaments. A restoration of this position is almost certainly out of the question, and it is paramount that the basis of Tyneside's livelihood should be broadened.

Such are a few of the questions dealt with. Space precludes more than bare reference to the many other points discussed. Detailed consideration is given to the shipbuilding and repairing and the coal industries, employment and wages; attention is paid to the educational facilities (on a low standard), to organized religion and social service, and to questions of local government. In health the Tyneside towns have a bad record from tuberculosis; in Jarrow the rate has risen distinctly since 1900. How much of this is derived from overcrowding and mal-nutrition (due to unemployment and fluctuating wages) it is difficult to say. The figures given suggest that a considerably more detailed study would be well worth while.

In conclusion, it is held that this generally depressing picture is the produce of a long period of prosperity. It is not, in the main, the result of the post-war economic depression. "In the years when mammoth liners were being launched, whilst navies were being built for our country and for foreign countries, during the great expansion of the coal industry, in the heyday of the chemical industry, this Tyneside was being brought into being. It was when rates were low that nothing much was done. It would have been possible then to accomplish what now is desperately hard to do. But the vision and the will were lacking. To-day, when the shortcomings of the area are being realized, there is a great struggle to exist at all, to keep industry going, to make some kind of provision for the unemployed, to get rates paid. Tyneside is called upon to wrestle in its black day with problems which would have taxed its resources heavily in its prosperous times" (p. 166).

For persons interested in industrial conditions and in a method of investigation that might profitably be applied to other areas, this book can be strongly recommended. It is written very clearly and readably and is free from the over-statement and bias to which the subject so readily lends itself.

A. B. H.

10.—*British Engineering Wages.* By Robert S. Spicer. 159 pp. London: Edward Arnold & Co., 1928. Price 10s. 6d. net.

The first third of this book consists of an examination of certain wages statistics in the engineering trades in Great Britain, principally in the years 1914 to 1927, and the remainder deals with the problems connected therewith and their solution. So far as can be seen no hint is given as to the sources of the principal statistics used, but the figures are stated to be drawn from the results of investigations at ten different dates between 1914 and 1927. The numbers covered by the investigations range from 215,000 in 1911 to 325,000 in 1927, and it seems almost certain that the figures represent the results of periodic enquiries made by the Engineering Employers' Federation at the various dates. It is impossible, however, to attach much precision to the results, as no account is given of the method of obtaining the statistics, nor are the results exactly defined. In Table I, for instance, the rates and earnings shown are, we assume, for adult males, although it is not definitely so stated in the case of the "unskilled" and "all other grades." No attempt is made to separate the earnings of those who are paid by results, but if the figures of the table are correct, then the earnings of the semi-skilled men are considerably higher than those of the skilled men who are paid a simple time-rate. Such a position, one would have thought, would have led to a good deal of discontent among the skilled men, the large majority of whom appear to be on a "time-rate" basis. When we come to the second table, which purports to give the weekly earnings of *all* classes, the doubt as to the validity of the results increases. The weekly earnings there given for April 1924 are 60s. 7½d. It happens that the Ministry of Labour made an enquiry as to the earnings in this industry in respect of one week in the same month, and their figure for earnings (covering 679,500 workpeople) was 51s. 3d., or 9s. 4½d. per week less than the earnings given in the volume before us. It is difficult to find an explanation of so great a discrepancy between the two results. Either Mr. Spicer's sample, although large (275,000), is not a representative one and relates principally to the better-paid portions of the industry, or probably, the figures are for male adults only. If the latter is the case the comparison is still more misleading in Table V, where for the purpose of insisting on the comparatively high wages in the engineering trade Mr. Spicer has quoted the weekly earnings in the textile trades. To state, for instance, that earnings in the cotton trade in March 1927 were only 58·7 per cent. of those in the engineering trade conveys quite a wrong impression of the really comparable rates in the two industries if it is not pointed out that in the cotton trade the adult males form not more than a quarter of the total, whereas in the engineering trade they form probably about three-quarters. Mr. Spicer should have compared the wages of pattern-makers or fitters with those of mule-spinners and he would not have found such a startling difference. This he could have done also in Table X, where he contrasts rates in certain "sheltered" and "unsheltered" trades. The difference of rates as shown in this Table is sufficiently striking and is made possible, so it is contended,

by the "unrestrained use of bargaining power" by organized "sheltered" labour. We should have imagined that there was little "restrictive" use of bargaining power in any industry where obtaining an advance or a reduction in wage was held to be necessary or thought to be possible.

Mr. Spicer holds that it is impossible to increase engineering wages on account of the lower labour cost per unit of production in competing countries, and a rise in wages without a corresponding increase in production would only add to the present difficulties of the industry. He draws attention to what he regards as the anomalous level of wages in "sheltered" industries and thinks that these should be reduced.

Notice is directed also to what is alleged to be the "mal-distribution" of the existing wages bill by reason of (1) the payment of skilled rates to those who, although in the category of skilled workmen, have not actually acquired such skill or at any rate do not use such skill in their daily work, and also (2) the payment to workers without family responsibilities of wages which have been increased, to some extent at least, through consideration of the cost or increased cost of maintaining a family.

Mr. Spicer's remedies, apart from a reduction in the "sheltered" industries, seem to be a redistribution of engineering wages (1) by introducing a system of family allowances and, (2) by regrading the wages of the skilled and semi-skilled workmen on a new system of classification which would take into account skill, indispensability, character, etc. No reduction in the total wages bill is contemplated, but apparently the redistribution is intended to be in place of any advances. No doubt the family allowances granted in France and elsewhere have been more in the nature of partial advances granted to some workpeople in lieu of a general advance to all, but Mr. Spicer's two suggestions contemplate the *withdrawal* of wages from some workpeople in order to increase the wages of others. Such a change seems almost impossible of achievement, and there seems much more likelihood of the industry improving its condition by increased production obtained by the extension of the system of "payment by results," though it is not at all clear that such a system is possible in all branches. The book is evidently one which entailed a large amount of research, and the latter half of it is highly interesting even if the arguments do not always command assent. W. A. B.

11.—*The Wages of Unskilled Labour in Manufacturing Industries in the United States, 1890-1924.* By Whitney Combs, Ph.D. 162 pp. New York: Columbia University Press, 1926. Price 9s. net.

This is an elaborate study of the wages statistics published by various Departments of the Federal Government of the United States and by the National Industrial Conference Board with the object of arriving at the trend of money wages and real wages of unskilled labour over the period 1890 to 1924. The sources of the information and the difficulties in defining exactly what is meant by the term "unskilled labour" are discussed. The defects and want of comparability of the material as between certain years of the period are

pointed out, and the statistics are examined industry by industry and illustrated by numerous charts and tables.

Money wages of unskilled labour in the United States are estimated to have been lowest in 1891 and highest in 1920, when they were more than three times as great (*i.e.* 25 dollars 98 cents as compared with 8 dollars 34 cents). Speaking broadly, the trend of wages in the period 1890 to 1914 was generally in an upward direction, but the total increase in the 25 years was only about 2 dollars per week. Large advances in wages began in 1916 and reached their maximum in 1920, when, as has been stated, they were nearly 26 dollars per week. The decline since that date had brought wages down to 21 dollars 79 cents in 1924. The increase in money wages has, however, been of only slight advantage to the unskilled labourer if the rise in the cost of living be taken into account. If we accept the index-numbers of cost of living which are used by Professor Coombs, real wages were lowest in 1915 (96) and highest in 1923 and 1924, but in these two latter years were only four points above real wages in 1897 and 1898. We have condensed Prof. Coombs's results into a table.

Quinquennial Period.				Index-number of Money Wages 1913 = 100.	Index-number of Real Wages. 1913 = 100
1890-1894	...	...	...	81.2	108.1
1895-1899	...	...	...	79.6	114.2
1900-1904	...	...	...	86.2	110.2
1905-1909	...	...	...	93.8	108.2
1910-1914	...	...	...	97.2	100.4
1915-1919	...	...	...	155.4	111.6
1920-1924	...	...	...	207.4	115.0

There is an error in the Chart on p. 121, where the real-wages index-number for 1919 has been plotted at 129 instead of 119.

W. A. B.

12.- *Buying Power of Labour and Post-War Cycles.* By Asher Achinstein, Ph.D. 164 pp. New York: Columbia University Press; London: P. S. King. 1927. Price 12s.

The object of this study is to apply statistical tests to the proposition that business cycles are chiefly due to the inability of the mass of workers to buy back the products of their labour, but incidentally it contains much other information of interest. The only continuous source of information as to consumers' incomes is furnished by the indices of pay-rolls of manufacturing establishments in the United States, as compiled by the Federal Reserve Board, with adjustments for secular trend and seasonal variations, but data from other sources are drawn upon when they are available.

Chapter I studies the fluctuations in the indices from 1919 to 1925 for 32 branches of industry, with special reference to the time sequence and amplitude of the movements disclosed. The figures cover two years and bear out the accepted opinion that movements concerning consumers' goods precede movements concerning pro-

ducers' goods, and that the amplitudes of the latter are greater than the amplitudes of the former. The next chapter deals in detail with the problem of deflating pay-rolls by regional cost-of-living indices, and then proceeds to compare the indices of consumers' purchasing power so obtained with indices of (physical) production of consumers' goods. The results confirm the view that pay-rolls fluctuate more than real incomes, and that buying power (as so expressed) lags some months behind production.

The third chapter compares fluctuations in the values produced in manufacturing plants with wages disbursed, and includes an interesting discussion of the problem of the lag between production and labour costs. After enquiries with the industries concerned, Mr. Achinstein decides to employ a variable lag which shifts according to the phase of the cycle. There seems to be some difference between the behaviour of the figures during the two cycles covered, and definite conclusions are difficult. Emphasis is laid upon the difference between consumers' and producers' reactions to price changes, and Foster and Catchings' theory is criticized on the ground that it exaggerates the rôle played by personal incomes in our money economy, to the neglect of the much more significant volume of purchasing power that passes annually among business enterprises.

The last chapter brings in such scanty information as is available with respect to consumers' incomes in general, and then proceeds to a final analysis of the flow of purchasing power. This section discloses a number of factors tending to the curtailment of purchases besides inadequacy of consumers' incomes, and it is concluded that the latter factor must be relegated to a rôle of secondary importance.

This book represents a high standard of technical achievement. Data are carefully sifted and scrutinized and commentaries are illuminating. There is one serious weakness, viz. that the study only covers two complete cycles, one of which is obviously affected by war influences.

L. R. C.

13.—*Coal and its Conflicts*. By John R. Raynes. 312 pp. London: Ernest Benn, Ltd. 1928. Price 21s.

This volume purports to be a brief record of the disputes between Capital and Labour in the coal-mining industry of Great Britain. It is an account, given almost entirely from the coal-owners' point of view, of the stoppages of 1912, 1921, and 1926, and the conditions which led up to them, together with a rather rambling account of earlier quarrels. With the large amount of material evidently at the disposal of the writer it seems a pity that he could not assume a more judicial attitude.

More attention should also have been given to the strike of 1893, which was the first struggle between the two great federations and ended fairly successfully for the miners. It was this success which possibly encouraged them to adventure further on the same lines. The author is wrong in stating that the men's federation accepted the principle of arbitration at the end of this dispute. The Miners' Federation throughout its existence has always opposed arbitration.

W. A. B.

11.—*La Population et les Tracés de Voies à Paris depuis un Siècle.* Par Maurice Halbwachs, Professeur de Sociologie à l'Université de Strasbourg. Les Presses Universitaires de France. Paris. 1928. Price 30 frs.

The above work is a revised and extended edition of the first part of the same author's volume entitled "*Les Expropriations et le Prix des terrains à Paris*" which appeared in 1900. It provides a comprehensive study of a problem in urban morphology wherein Professor Halbwachs discusses various factors which have contributed to the structural changes and growth of the French capital during the nineteenth century. The author endeavours to discover the causes which can explain the structural changes and development of a city so large and complex as Paris, but though extensive references describe the possible effects of the activities of administrators, speculators and others who produced many of the changes in the physiognomy of Paris, we confess to some disappointment in failing to discover adequate recognition of the growing sanitary needs of the city—a factor which must have been of first-rate importance. It is well known that while the social and intellectual life of Paris in the early nineteenth century was far superior to that of London, life in Paris was, in many respects, not only inconvenient, but less agreeable than in the English city. The streets were narrow and lacked adequate services for their cleansing; crowded slum areas served as pestilential centres of infection; typhoid was one of the prevalent diseases of the city, and the cholera epidemic of 1832 was responsible for approximately 500 deaths a day. French sanitarians of the time must have been aware of the prevailing conditions, and their demands in the interests of public health must have played no small part in determining the action of various central authorities, in demanding the demolition of unsanitary areas, the construction of new, wider and cleaner streets, and the provision of healthier dwellings for the people. On such important subjects as these the author is silent.

P. G. E.

15.—*Other New Publications.**

Carnegie Endowment for International Peace. Dictionary of Official War-time Organizations. By N. B. Dearle, M.A., D.Sc. xvii + 323 pp. London: Humphrey Milford, 1928. Price 12s. 6d. net.

[A systematic record of the numerous official organizations which were formed to deal with the especial problems created by the war and its after-effects. These bodies are grouped, in alphabetical order, under the heads of the various Government departments by whom they were appointed. In each case the origin, object, and interests represented by the organizations are briefly stated and, where possible, the date of dissolution. The total number would appear to be not far short of 3,000, excluding non-official organizations and local bodies set up independently of the central authorities.]

* See also "Additions to the Library," p. 147 et seq.

Clarke (J. J.). Outlines of Central Government. Including the judicial system of England. 3rd ed. 251 pp. London: Pitman, 1928. Price 5s. net.

[The first edition of this handbook, issued in 1919, consisted of 106 pages of text and 5 of bibliography; in the present one the text occupies 214 and the bibliography 22 pages, and there are in addition nearly 15 pages of index. The new matter partly relates to departments and procedures which have been established since the book was first written, but largely consists of amplifications and explanations, including some brief historical notes which add considerably to the value of the work. Its plan is that of a short encyclopædia or dictionary, arranged under classified headings and subheads, and thus is appropriate for purposes of reference rather than for reading. It should be found useful by the ordinary person who wishes to know, for example, what are the functions and privileges of the House of Lords, or when the Post Office was established, or to ascertain the precise differences between a select, a joint, and a hybrid committee of Parliament. One of the most useful sections is, as before, that on the judicial system of England, which describes the nature and functions of the various courts and officials, with an account of procedure in each, and notes on their history. An appendix summarizes the "Kellogg proposal."]

Dicksee (Lawrence R.). Office Machinery and Appliances. A handbook for progressive office managers. 3rd ed. xvi + 195 pp. London: Gee & Co., 1928. Price 10s. 6d.

[Since the issue of the first edition in 1916, the developments in office machinery have been so extensive that to describe them adequately has involved the rewriting of the book. There are numerous illustrations of the appliances in question, and examples of the work actually performed by them.]

Forsyth (C. H.), Ph.D. Introduction to the Mathematical Theory of Finance. 205 pp. New York: John Wiley & Sons. London: Chapman and Hall, 1928. Price 12s. 6d. net.

[Under this portentous title the reader will find arithmetical and simple algebraical calculations relating to annuities, interest, and discount, capitalization, depreciation, insurance, and so forth. Exercises are appended to each chapter, and the last section of the book consists of Tables showing compound interest, present value, annuity values, number of days between two dates, mortality experiences, and common logarithms.]

Hawtrey (R. G.). Currency and Credit. 3rd ed. vii + 177 pp. London: Longmans, Green & Co., 1928. Price 16s. net.

[This is a new edition of Mr Hawtrey's well-known book, which appeared first in 1919 and in a second edition in 1923. While the main argument and method have not been changed, a considerable amount of rewriting has been found necessary, mainly in the case of the chapters relating to the economic aspects of war in general and to the history of the Great War in particular; and elsewhere the reasoning has been elaborated or amended in numerous places in the light of the multifarious discussions evoked by the monetary experiences of the last few years. In this edition a clear distinction is made between the theoretical portion (Part I) and the historical portion (Part II).]

International Labour Office. Methods of compiling Housing Statistics. viii + 119 pp. Geneva, 1928. Price 1s. 6d.

[This book, which is based on a former study of one submitted to the International Union of Municipalities at its meeting in Paris in 1925,

is said to be the first systematic attempt at the standardization of state and municipal statistics of housing, and is based on material supplied by the authorities concerned. Under the head of "General Problems" the methods of investigation and the collection and presentation of the data are set forth. The remainder of the book is devoted to different branches of housing statistics. These include the definition and classification of dwellings, density of occupation, rents, the housing market, and statistics of fluctuations in the supply of houses and their characteristics. A useful bibliography of official statistical reports relating to housing is given in an appendix.]

McBain (A. G.). Complete Practical Income Tax. 4th ed. x + 267 pp. London: Gee & Co., 1928. Price 7s. 6d.

[Each of the earlier editions of this book has been noticed in the *Journal* (1926, p. 165; 1927, p. 170; 1928, p. 65). The present edition has been brought up to date in accordance with recent rulings and concessions. The author considers that the simplification of the income tax is now fairly complete and that Finance Acts will be less complex in the future than in the past.]

Monighetti (Wladimir). Où est l'issue? Problèmes contemporains sociaux et économiques. Projet d'un nouveau système financier permettant la suppression de tous les impôts. Traduit du russe par N. Kratiroff. 138 pp. Paris: Imp. Voltaire, 1927. Price 12 frs.

[The author's panacea is the establishment of a State Mortgage Bank of Issue, the details of the administration and working of which are set out in this little book.]

Pearse (Arno S.). Colombia: with special reference to Cotton. 131 pp. Manchester, 1928. Price 10s. 6d.

[A report of a tour made at the invitation of the Colombian Government to examine the present state of the cotton industry of Colombia and the possibilities of its development. It includes a survey of the economic and social conditions of the country and of its other industries and products. With reference to cotton itself, it was found that the qualities varied largely in the regions visited, the finer qualities being grown alongside inferior grades. The report urges the necessity of eliminating the inferior plants, the establishment of a special cotton service and of seed farms, and includes advice to mill-owners, cotton-buyers and farmers. There are illustrations and an index.]

Reinhold (Dr. Peter). The Economic, Financial, and Political State of Germany since the War. 134 pp. New Haven: published for the Institute of Politics by the Yale University Press. London: H. Milford, 1928. Price 8s. 6d.

[The post-war vicissitudes of German currency are here described by an ex-Finance Minister of the Reich. The book, which consists of six lectures, deals with the period covered by Lord D'Abernon in his Presidential Address to this Society, the events he narrated objectively and consequentially being now viewed from within and arranged under varying aspects. Dr. Reinhold, who took office in 1926, gives an account of the stabilization process which affords a glimpse into the economic consequences to individual human welfare. In addition to the wiping out of almost the entire incomes of small annuitants and rentiers, and of Government indebtedness for goods supplied during the war, we are told that administrative economics caused the dismissal from the employ of the central Government alone of 330,000 persons, 114,000 of whom were officials of "permanent" status. One chapter is devoted to the prospects of the Dawes plan, for the authors of which Dr. Reinhold expresses the deepest admiration: if we note that he only refers to the work of

the American delegates we may remember that his original audience was composed of their countrymen. The last chapter is on the problems of Transfer and of Germany's future. As to this last Dr. Reinhold is sanguine, basing his confidence on the spirit and capacity for work and endurance of the German people.]

Répacì (F. A.). Sviluppo demografico, economico e finanziario di una grande Città Italiana. 102 pp. Torino: La Riforma Sociale, 1928.

[This survey of the development of Turin during the past hundred years is an assemblage of three separate studies originally published in *La Riforma Sociale*. The text is practically unaltered, but has been slightly rearranged and is now presented in the following divisions: Population, including an examination of the 1921 census results; Finance; Taxation; and changes in the Consumption of food-stuffs. Prof. Répacì was formerly Director of the Municipal Office of Statistics and so enjoyed access to all the data and the opportunity of investigating the facts on the spot, and he offers the results of his researches as likely to afford useful comparisons with the statistics of other cities and of the nation. His description is accompanied by detailed figures and the conclusions to be drawn therefrom are conveniently summarized at the end of each section. His general conclusion is that both demographical and economic movements are continuing along the lines observable since about the middle of last century, now that the disturbances caused by the war have subsided. The main features are a steady decline in the birth-rate with a lesser diminution in the death-rate, coupled with a large and growing increase in the population due to the great influx of workmen, who are employed on the great public works undertaken by the city since 1925. Concurrently, municipal expenditure is increasing, absolutely and per head of the population, and with it the burden of taxation and the cost of living. The taxation is mainly indirect and the greater part of it is levied on consumable commodities; and the cost-of-living index, based on 1914 = 100, which was 413.9 at the end of 1920, showed an average of 592.6 in 1926, and of 494.7 for the first five months of 1928. The wholesale price index, based on 1913, was 647.9 in the first quarter of 1926 and 492.7 in April 1928.]

Robertson (Bernard) and Samuels (H.). Pension and Superannuation Funds: their formation and administration explained. x + 134 pp. London: Pitman, 1928. Price 5s. net.

[This study deals with contributory pension schemes, and the conditions and problems which they involve; its aim is to set out the fundamental principles which should govern their formation, and attention has been devoted to the legal aspects.

An appendix contains selections from Acts of Parliament pertinent to the subject, and a bibliography and index are provided.]

Roumania. The Mines and Metallurgical Works of the Roumanian Government. (Four parts, in case.) Bucarest: Min. of Commerce, 1928.

[Four monographs describe the various mining and metallurgical undertakings which are carried on under Government control in Transylvania. They include accounts of plant and output, of the means of transport of the raw materials and of the finished product, of laboratory equipment for research, and of the personnel. The work is illustrated by photographs as well as by maps and plans.]

Sweden. Social Work and Legislation in Sweden. Survey published by order of the Swedish Government. vi + 289 pp. Stockholm: P. A. Norstedt and Sons, 1928.

[An amplification of a report issued in 1921 by the Royal Social Board on Social Legislation in Sweden. It includes an introductory survey of the country's natural resources, principal industries, population, and general standard of living. The subsequent chapters briefly review the various branches of social work under twelve main headings, of which may be mentioned the Organization of Social Work, Employers and Workers, Social Insurance, Hygiene and Care of the Sick, Public and Private Charity, Housing, Co-operation and Education. The book is illustrated with photographs and diagrams and has a full table of contents.]

Wardwell (Charles A.). An Investigation of Economic Data for Major Cycles. A thesis in finance presented to the Faculty of the School of the University of Pennsylvania. 147 pp.; appendix. Philadelphia, 1927.

[This study aims at the isolation and measurement of a fourth component which, it is supposed, enters into economic time series, viz. a major cycle of about fifteen years. Data are collected from various sources and entered over the last sixty years. The author's method depends upon a series of successive approximations involving an elaborate process of averaging and interpolation according to arbitrary rules which he does not attempt to justify, and his diagrams are too hazy and indistinct to be serviceable.]

CURRENT NOTES.

The totals of the overseas trade of the United Kingdom show reductions in gross imports, re-exports, and net imports, and an increase in British exports. The decline in imports would have been greater had not the periodical revaluation of non-dutiable parcels sent by post (which is based on a test examination) taken place in the spring of 1928, and raised the value of the imported parcels of this kind to £9,127,000, or treble the value of similar parcels imported the previous year. The value of exported parcels was also increased. Imports of food, drink, and tobacco were down by 1.2 per cent., raw materials by 4.8 per cent., and manufactured foods by 1.4 per cent. One important feature of the raw material imports was the reduction in the quantity of rubber imported and the fall of nearly 40 per cent. in its average value per cental. Retained imports of cotton were slightly larger than in 1927, but there was a reduction of 7.1 per cent. in sheep's and lambs' wool. Another noteworthy point is the continued decrease in the imports of iron and steel goods; retained imports of woollen and worsted tissues, however, increased. There was a large increase in re-exports of rubber. Exports of British produce and manufactures were over 2 per cent. greater in value than in 1927, food, drink, and tobacco being greater by 3.8 per cent. and manufactured goods greater by 2.6 per cent., while raw materials (chiefly coal) were less by 8.1 per cent. Exported coal was over a million tons less than in 1927, and the average value was down by 2s. 3d. per ton. Exports of iron and steel goods, machinery, and (notably) new ships improved in quantity over 1927, but exports of cotton yarns and piece goods were less, and there was little change in the exports of woollen and worsted tissues. The recorded excess of imports over exports of merchandise, bullion, and specie in 1928 was £341,456,000, but the exports include £18 millions sent to France, which was the repatriated French gold previously pledged by the Bank of France with the Bank of England as security for a loan repaid in 1927. The true excess of imports in respect of current transactions was £359,456,000, or £30,223,000 less than in 1927.

The figures showing the details usually given in these Notes are as follows :—

Movements and Classes.	1927.	1928.	Increase (+) or Decrease (—) in 1928.			
Imports, c.i.f.—	£'000.	£'000.	£'000.			
Food, drink, and tobacco	538,527	531,913	— 6,614			
Raw materials and articles mainly un-manufactured	351,740	334,820	— 16,920			
Articles wholly or mainly manufactured ...	322,412	318,016	— 4,396			
Other articles ...	5,662	12,191	+ 6,529			
Total Imports ...	1,218,341	1,196,940	— 21,401			
Exports, f.o.b.—						
<i>United Kingdom Produce and Manufactures—</i>						
Food, drink, and tobacco	52,278	54,272	+ 1,994			
Raw materials and articles mainly un-manufactured	76,352	70,168	— 6,184			
Articles wholly or mainly manufactured ...	563,914	578,629	+ 14,715			
Other articles ...	16,537	20,359	+ 3,822			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	26,514	27,538	+ 1,024			
Raw materials and articles mainly un-manufactured	71,233	66,494	— 4,739			
Articles wholly or mainly manufactured ...	25,046	26,039	+ 993			
Other articles ...	160	281	+ 121			
Total Exports ...	832,034	843,780	+ 11,746			
Bullion and Specie—						
Imports ...	39,578	58,008	+ 18,430			
Exports ...	36,206	69,712	+ 33,506			
Movements of Shipping in the Foreign Trade—	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	33,476	40,422	32,118	40,220	— 1,358	— 202
Foreign ...	26,872	20,168	25,501	20,117	— 1,371	— 51
Total entered ...	60,348	60,590	57,619	60,337	— 2,729	— 253
<i>Cleared with cargoes—</i>						
British ...	38,174	42,363	38,249	43,378	+ 75	+ 1,015
Foreign ...	22,259	21,137	21,446	21,071	— 813	— 66
Total cleared ...	60,433	63,500	59,695	64,449	— 738	+ 949

Alike in 1927 and in 1928 the British tonnage entered and cleared with cargoes was about double the foreign tonnage; British vessels, further, were larger, for of the total number of vessels entered with cargoes in 1928, about 44 per cent. were foreign, and of those cleared with cargoes about 36 per cent. were foreign. There was a reduction of about 0.4 per cent. in the total tonnage entered with cargoes and an increase of about 1.5 per cent. in the total tonnage cleared with cargoes; for British tonnage only the changes were respectively a decrease of about 0.5 per cent. and an increase of about 2.4 per cent.

The *Board of Trade Journal* for 24th January, 1929, compares the import and export trade of 1928 with that of 1924 on the basis of the prices ruling in the earlier period. The following table summarizes the results for the last two years:—

Trade of 1927 and 1928.

Class of Trade.		Declared Value.	Estimated at Prices of 1924.	Trade of 1924. Declared Value.
		£ mill.	£ mill.	£ mill.
Imports :	1927.....	1,218.3	1,391.2	1,277.4
	1928.....	1,196.9	1,350.5	
British Exports :	1927.....	709.1	819.4	801.0
	1928.....	723.4	838.2	
Re-exports :	1927... ..	123.0	126.1	140.0
	1928.....	120.4	123.2	

Imports in 1927 were 8.9 per cent. greater in volume than in 1924, and in 1928 were 5.7 per cent. greater. Exports of United Kingdom goods were 2.3 per cent. greater in 1927 than in 1924, and in 1928 they were 4.6 per cent. greater. For the whole year 1928 the volume of retained imports of raw materials was about 1.3 per cent. larger than in 1924, but about 11 per cent. less than in 1927 (due mainly to the heavy imports of the first quarter of 1927). The volume of British exports of manufactured goods in 1928 was over 3 per cent. greater than in 1927, and 8 per cent. greater than in 1924.

During the second half of 1928 there was little change in the level of wholesale prices in this country as measured by the Board of Trade index-number. From August to the end of the year the price indices were appreciably lower, for both food and industrial materials, than in the first seven months. The index for all commodities from January to July varied between 84.3 (February) and 86.4 (May), whereas in the last five months the limits of variation were 83.8 for August prices and 82.8 for September prices. The year closed with the index based on average prices for December

standing at 83.2 (1924 prices = 100); the figure for food was 91.6, and that for industrial materials was 80.0.

Wholesale prices, as measured by this index-number, were, on the average, lower in 1928 than in 1927 by nearly 1 per cent., the index-numbers for the two years being 84.4 and 85.2 respectively. Although the wholesale prices of food were higher on the average by 0.2 per cent. in 1928 than in 1927, the index for December, 1928, showed a fall of 1.9 per cent. compared with the figure for December, 1927, the averages for the second half of 1928 being considerably lower than the averages for April, May and June. The combined indices for food for each of the months July to December, 1928, were lower than the indices for the corresponding months of 1927. Industrial materials averaged 1.6 per cent. cheaper in 1928 than in 1927, and compared with the base year 1924, the combined indices for each of the last four months of 1928 showed falls of 20 per cent. As between December, 1927, and December, 1928, the average fall in the prices of industrial materials was 1.4 per cent. The outstanding changes shown by a comparison of the averages for 1927 with those for 1928 were the fall in prices of metals and minerals, the rise in textiles, the fall in cereals and the rise in meat prices. As the last two were less than half as great as the first two, the balance of the movement shown by the general index-number was, in the main, determined by the excess of the fall in metal and mineral prices over the rise in prices of textiles. As a matter of fact both these movements actually occurred within the year 1927, and the changes of the year 1928 itself were markedly different from what might be suggested by a superficial comparison of the averages for the two years.

If the average of 1913 prices be substituted as the basic figure in the index, the average for 1928 is represented by 140.3, as compared with 141.4 for 1927 and 148.1 for 1926. On this basis the index for the year 1928 for the food group was 152.3, which covered a range from 140.9 for meat and fish to 166.7 for the miscellaneous food-stuffs, while that for the industrial materials group was 133.9, covering a range from 112.3 for iron and steel and 112.2 for other metals and minerals to 164.2 for cotton and 164.9 for other textiles.

In the middle of December the *Economist* announced that beginning with the following month it was proposed to recast the basis of its index-number of wholesale prices. It will be recalled that the *Economist* index was framed originally in 1864 to measure the rise of prices following upon the Californian and Australian gold discoveries. After a lapse of forty-seven years it was remodelled in 1911, additional commodities were added and a new period, viz.

1901-5 was chosen as the base. An index-number of prices has two distinct objectives: firstly, it must reflect "short-period" fluctuations, and secondly, it must register, as accurately as possible, "long-period" alterations in the value of money. The reform of the index-number now adopted has been designed to enable it to discharge this second function more accurately. In view of the violent disturbance which has taken place in the price structure in the past fourteen years, it has been decided not only to revise once more the list of commodities comprised in the index-number, but also to employ the method of geometric, in place of arithmetic, averages in its compilation. It is unnecessary in these pages to reproduce the arguments by which the *Economist* justifies this latter change, beyond quoting the disparity between the extreme price changes of particular commodities since 1901-5 recorded by the old index, *e.g.* in 1927 from 34 (rubber) to 322 (tea), which made it pretty safe to assume that the arithmetic average had consistently had a bias towards exaggerating the *long-period* rise of prices. This assumption is tested by the following results:—

"Economist" Index.

(1913 = 100.)

Year.	Arithmetic average.	Geometric average.
1920	283.2	259.8
1921	181.0	172.7
1922	159.5	154.0
1923	162.1	154.4
1924	173.9	165.7
1925	166.5	162.1
1926	152.8	148.8
1927	147.9	143.7

It was accordingly decided to start a fresh index, with 1927 as a base, using 143.7 as a coefficient to link the new series, for purposes of historical comparison, with 1913. This new index is based upon 58 commodities as against 14 in the old index.

Reviewing wholesale prices in 1928 in the light of the new index (1927 = 100), we find that at the close of 1927 the level was 98.8. The second quarter of the year marked an appreciable increase to over the 100 level, reaching 102.1 in May. The end of July saw a return to the figure of 98.8, and thereafter the level fell till at the end of the year it stood at 95.0. The average level for the year was 98.1, increases of 3.6 and 5.1 per cent. respectively in the case of cereals and meat and textiles, being outweighed by falls of 6.2 7.9 and 4.2 per cent. recorded for "other foods," minerals and "miscellaneous" commodities. A comparison of the figure at the

end of December, 1928, with that at the end of December, 1927, showed on balance a decline of nearly 4 per cent., which was due to lower values in the "other foods" and "miscellaneous" sections, the net changes on balance in the other groups being negligible.

The *Statist* index-number of wholesale prices agrees with those noted in the preceding paragraphs in characterizing the price level of the last five months of 1918 as comparatively stable after a period of higher prices in the second quarter of the year. The highest point was recorded at the end of May (126.2), and by the end of August this had fallen to 118.0, to which it practically returned at the end of the year (117.9) after a very slight depression in the intervening months. Over the whole year prices at the end of December were 2.9 per cent. lower, a reduction for which the materials group was mainly responsible with an average decrease of 4.3 per cent., whereas food prices fell only by 0.9 per cent. The provisional *Statist* index-number for the year 1928 (i.e. the average of the monthly index-numbers) was 120.6. It is interesting to note that according to the *Statist*, a comparison of the international wholesale prices index-numbers shows that the rise in prices since the war is less in Great Britain than in the case of any of the gold or gold exchange standard countries, according to the latest figures available at the time of writing. *Bradstreet's* figure for the United States was then 43.6 per cent. above the pre-war level, compared with an increase of only 41.9 according to the *Statist* index. At the time of the return to the gold standard, the United States index was 144.6 (on a pre-war basis), while the comparable *Statist* figure for this country was 161.8.

The following table summarizes movements in the general level of retail prices in Great Britain and Northern Ireland, as estimated by the Ministry of Labour:—

Percentage increase in retail prices since July, 1914.

				Food only.	All items included in the Budget.
				Per cent.	Per cent.
August 1	...	...	...	56	65
September 1	...	...	...	56	65
October 1	...	...	...	57	66
November 1	...	...	...	59	67
December 1	...	...	...	60	68
January 1	...	...	...	59	67

The increases in the items other than food included in the figure of 67 on January 1 were, rent (including rates) 52, clothing 120, fuel and light 70, and other items 80. In reviewing the course of this

index-number during 1928 the *Labour Gazette* notes that there was only a 4 points difference between the highest and lowest figures of the year, and that in no other year since the inception of this series in August, 1914, has so little fluctuation been recorded. The latest figure on January 1, 1929, viz. 67 per cent., was only one point below that of a year before. For food alone there was a decline of 3 points over the year, which was due to lower average prices for bread, flour, sugar, potatoes and eggs. On the other hand, butter and cheese were appreciably dearer than a year before. The average increase in all items for each of the twelve months in 1928 was 66 per cent. as compared with 67½ for 1927, and 149 in 1920; this indicates that the general level of the cost of living of working-class families in 1928 was about two-thirds of that in 1920, the year in which the highest price-levels were reached.

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increase for all the items covered by the budget in each case, such items, in addition to food, comprising generally rent, clothing, fuel and light, and other household requirements:—

Country.	Date of latest return.	Food.	All Items.
		Percentage increase.	Percentage increase.
<i>Overseas Dominions, etc.</i>			
Australia	October, 1928	50	46 (1st qr.)
Canada	December, 1928	54	58
India (Bombay)* ...	December, 1928	45	48
Irish Free State ...	October, 1928	71	76
New Zealand	November, 1928	50	62
South Africa	November, 1928	31	15
<i>Foreign Countries.</i>			
Belgium	November, 1928	—	742
Czechoslovakia (Prague)	November, 1928	800	621
Denmark	October, 1928	46	72
Egypt (Cairo)	October, 1928	54	—
France (Paris)	December, 1928	496	431 (4th qr.)
France (other towns) ...	November, 1928	462	—
Germany	December, 1928	53	53
Holland (Amsterdam) ...	September, 1928	—	69
Italy	November, 1928	455	428 (Milan, in Oct.)
Norway	November, 1928	61	84
Spain (Madrid)	November, 1928	81	—
Sweden	December, 1928	51	72 (Oct.)
Switzerland	November, 1928	58	62
United States	November, 1928	54	70 (June)

* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland, quoted on p. 598 of Part IV, 1928, of the *Journal*, the *Labour Gazette* observed during July a further decline in employment which extended, in varying degrees, to most of the principal industries. Employment during August, apart from the temporary fluctuations at the holiday periods, showed little change in total volume, and the next month also showed little change. The decline was resumed in October and continued in November. The first three weeks of December showed a substantial improvement due to seasonal factors, but a sharp rise in the numbers unemployed in the last week left the position considerably worse than it was at the end of November. These general statements of the *Labour Gazette* are illustrated by the official statistics reproduced in the table below. In connection with these statistics it should be noted that their comparability with previous figures is somewhat impaired by changes in the conditions for the receipt of unemployment benefit brought into operation on April 19 by the Unemployment Insurance Act, 1927. Further, for purposes of comparison with the corresponding dates in 1927, it should be noted that in 1928, owing to the operation of the Widows, Orphans and Old Age Contributory Pensions Act, 1925, a number of persons of the age of 65 and upwards ceased to register as unemployed. The net effect of these two sets of circumstances was to increase the live register probably by 40,000, and to increase the number of insured persons recorded as unemployed by a rate of rather less than 0·3 per cent.

Date.	Percentage Unem- ployed among Insurable Workpeople.	Date.	Numbers (Insured and Uninsured) registered at Employ- ment Exchanges.
June 25	10·8	June 25	1,239,000
July 23	11·7	July 30	1,354,000
August 20	11·7	August 27	1,367,000
September 24	11·4	October 1	1,384,000
October 22	11·8	October 29	1,421,000
November 26	12·2	November 26	1,439,000
December 17	11·2	December 17	1,312,000

In a review of employment and wages during 1928 the *Labour Gazette* states that employment was not maintained at the level reached in the previous year, when the average number of insured persons actually in employment was the highest ever recorded, and the average percentage rate of unemployment among insured persons was lower than in any year since 1920. The average percentages of insured persons unemployed in Great Britain and Northern Ireland from 1921 to 1928 were as follows :—

				Per cent.					Per cent.
1921	...	...	...	17.0*	1925	...	...	...	11.3
1922	...	...	...	14.3	1926	...	...	...	12.5*
1923	...	...	...	11.7	1927	...	...	...	9.7
1924	...	...	...	10.3	1928	...	...	...	10.9

* Exclusive of persons in the coal-mining industry disqualified for unemployment benefit by reason of trade disputes.

The seasonal improvement in employment which normally covers the first half of the year was confined in 1928 to the first quarter; during which the percentages of unemployed were lower than for the corresponding dates in 1927. Between the end of March and the end of June the percentage unemployed rose from 9.5 to 10.7 (this increase being subject, of course, to the qualification indicated in the preceding note). During the second half of the year the movement followed the normal seasonal trend, but at a higher level. The cause of this higher level, which followed on the set-back to employment in the second quarter, was largely due to unemployment in six large industries, viz. coal-mining; shipbuilding and ship repairing; the cotton, woollen and worsted, and linen textile industries; and the boot and shoe industry. These industries account for about one-fifth of the total numbers insured. The statistics thus show that the apparent decline in employment in 1928 as compared with 1927 was not the result of a general and uniform decline in industry as a whole. If the six large industries referred to above were excluded throughout, the percentage rates of unemployed would be as follows :—

Month.	1927.	1928.	Month.	1927.	1928.
January ...	10.8	9.6	September ...	7.8	9.1
February ...	9.8	9.3	October ...	8.2	9.5
March ...	8.7	8.4	November ...	8.7	10.1
April ...	8.0	8.1	December ...	8.8	9.7
May ...	7.4	8.0	Mean for the year ...	8.4	8.9
June ...	7.3	8.1			
July ...	7.3	8.6			
August ...	7.5	8.9			

These figures for 1928 conform much more closely to the normal seasonal trend than do the percentages for all the industries taken together. Even after the six industries are eliminated, however, the rate was higher in the second half of 1928 than in that of 1927, though it must be remembered that heavy unemployment in these six important industries would in itself influence the course of employment in some other industries.

Rates of wages generally showed little movement in 1928, the great majority of workpeople being unaffected by any changes in

rates during the year. The most important changes, as indicated by the amount of wages involved, were reductions in coal-mining, in the building industry, and in the railway service. In all the industries and services for which statistics are available to the Ministry of Labour the changes reported in 1928 resulted in an aggregate net reduction of £163,000, in the weekly full-time rates of wages of 1,608,000 workpeople, and in a net increase of £21,150 in those of 212,000 workpeople. In 1927 there were net decreases amounting to £388,500 in the weekly full-time wages of 1,855,000, and net increases of £30,700 in those of 282,000 workpeople. It may be observed that in the case of agriculture, which is not covered by the Department's statistics, the minimum rates fixed by the various Agricultural Wages Committees for adult male workers remained unchanged in 1928, except for slight reductions in Glamorgan, Merioneth and Montgomery.

The net results of all the changes reported to the Ministry of Labour in 1928 was a decrease of approximately £140,000 in the weekly full-time wages of the workpeople in the industries covered by the statistics. As, however, the rates of wages of the great majority of workpeople remained unchanged throughout the year, the effect of this reduction on the general level of wages was relatively small, being equivalent to less than 1 per cent. When account is taken of all the information in the possession of the Department, it is estimated that the average increase between July, 1914, and the end of 1928, in the weekly full-time rates of wages of those classes of workpeople for whom particulars are available (including agricultural workers) was between 70 and 75 per cent.

Changes in the normal hours of work reported to the Department in 1928 were almost negligible. In fact, since the widespread reductions in hours of labour in 1919-20, hours generally have remained practically unchanged, apart from the increase in 1926, which was almost entirely the result of the longer working day for coal-miners.

The number of trade disputes of any significance causing stoppages of work, reported to the Ministry of Labour as beginning in 1928 in Great Britain and Northern Ireland, was 302. The number of workpeople directly involved (*i.e.* on strike or locked out) in these disputes was nearly 80,000; the number indirectly involved was about 44,000. In addition about 500 workpeople were involved, directly or indirectly, in eight disputes, which began in 1927 and continued into 1928. The total number of workpeople involved in all disputes in progress in 1928 was thus about 124,000, and the aggregate number of working days lost in these disputes was rather

more than 1,400,000. The number of disputes was about the same in 1928 as in 1927, and the number of workpeople involved and the time lost by them was slightly greater in 1928 than in the preceding year. By reference, however, to a table printed in the *Labour Gazette*, giving the records as far back as 1893, it can be seen that, apart from 1927, the number of disputes and their aggregate duration was less in 1928 than in any previous year covered by the table, and the number of workpeople involved was less than in any previous year except 1903, 1904 and 1905.

Official statements as to employment in Germany quoted from the *Reichsarbeitsblatt* by the *Labour Gazette* showed during June and July a continuous deterioration in the industrial position. The published statistics, however, showed no sign of this, for the Employment Exchanges making returns reported at the end of the latter month, 1,154,635 persons on the "live register" as against 1,248,895 at the end of May, and the percentage of unemployment reported by trade unions with a total membership of four and a third millions remained unchanged over these two months at 6.3. In August, however, the statistics confirmed the official generalization as to the continued worsening of the position; the numbers on the "live register" rose to 1,162,000 and the trade union percentage of unemployment to 6.5. An increase in exports, more work in the building trades, and harvest demands stabilized the position during September, but in October and November seasonal factors combined with the results of the dispute in the Rhenish-Westphalian metal industry to aggravate the position, so that by the end of the latter month the numbers on the "live register" of the Exchanges had risen to 1,762,365, as compared with 1,254,847 a year before, and the trade union percentage of unemployment had reached 9.5 as against 7.4 a year before. In France during the second half of 1928 there would appear to have been very little unemployment apart from local and temporary causes, and in many districts the demand for labour continued greater than the supply. The number of persons remaining on the "live register" of the exchanges was throughout small and the changes from 8,009 at the end of July to 11,457 on December 1 and thereafter down again to 7,916 at the end of the year had little significance. In the case of Norway the trade union percentage of unemployment fell from 18.5 at the end of April to 11.1 at the end of June, and then rose again till it reached 14.8 at the end of October. In each case, however, the rate was considerably less than a year before, when it ranged from 17.3 per cent. at the end of July to 21.5 per cent. at the end of October.

Similarly in Sweden the trade union percentage of unemployment fell from 8.1 at the end of May to 7.1 at the end of August, and rose to 10.8 at the end of November, as against a minimum figure of 7.8 per cent. at the end of August and a rise to 12.5 per cent. at the end of November in 1927. In the third Scandinavian kingdom, returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange showed the lowest seasonal figure of unemployment at the end of September, when the rate was 12.2 per cent., as compared with 16.0 per cent. a year before, when the figure was also the minimum for the year. By the end of November the rate had risen to 17.6 per cent., but this still compared favourably with a year before, when it stood at 21.8 per cent.

In Canada the index-number of employment is based upon returns received from approximately 6,600 firms employing about one million workpeople, and has as its base the volume of employment during the week ending January 17, 1920. Standing at 112.4 on June 1, this index reached its seasonal maximum at 119.9 on August 1, when it was fully 10 points above the corresponding maximum of a year before. It fell to 118.9 on October 1, but thereafter showed a slight recovery to 119.1 on November 1, which left it in a position comparing very favourably with that of a year before, when the index-number stood at 107.5. The monthly report on employment issued by the Federal Department of Labour Statistics at Washington is now based upon returns received from over 21,000 establishments, having been extended to cover, not only manufacturing industries, but also coal-mining, metalliferous mining, public utilities, trade (wholesale and retail) and the hotel industry, and it now covers over four million workpeople. The first report issued on this new basis, that for November, 1928, showed a contraction in the volume of employment amounting to 0.5 per cent. The index-number of employment, which has as its basis average monthly employment in 1923, continues for the present to rest upon returns received from nearly 12,000 establishments in 54 of the chief manufacturing industries. Standing at 85.6 in June, it showed an unfavourable comparison with a year before (89.1), and this comparison persisted till September, when the index had reached 87.3, as against 88.0 a year before. In October, however, a continued expansion of employment carrying the index to 88.1 reversed the comparison with a year before (87.6), and a slight contraction in November to 87.7 still left the figure above that for November, 1928, viz. 85.9.

We have received from the publishers, Messrs. Macdonald and Evans, a copy of the fourth edition, recently issued, of Professor Bowley's *Elementary Manual of Statistics* (price 7s. 6d. net). This is Professor Bowley's non-mathematical work, "intended for the use of those who desire some knowledge of Statistical methods and Statistical results without going deeply into technicalities or undertaking mathematical analysis." In the new edition, Part I, dealing with general principles—accuracy, averages, diagrams, tabulation, sampling and elementary methods of analysis—has not been altered: the example given serve only to illustrate principles, and the particular date to which any given figures relate is of no importance. Part II, however, the ten chapters of which deal with different groups of statistics—the census, vital statistics, trade and transport, prices, wages, and so forth—has been very largely rewritten and extended by some thirty pages. The illustrative figures have been modernized, and some new illustrations have been added from the statistics of the U.S.A. Certain methods are now treated much more at length, and wherever we have tested it the information seems to have been brought very closely up to date. The demand for a new edition shows that the volume has proved its usefulness. The exposition is brief and simple, and a surprising amount of ground is covered for so small a volume. It should help to keep the elementary student clear of many fallacies and blunders, and render him cautious in handling his data. Even the more experienced statistician may well find Part II of service in fields with which he is not familiar.

Shortly before going to press we received from the German Statistical Office a folio volume of 910 pages entitled "*Die Wirtschaft des Auslandes, 1900-1927.*" As explained in the preface, this monumental work is designed to afford material for ascertaining the part taken by each separate country in the industry and trade of the world, chiefly with a view to the direction of the development of German industry; and, accordingly, the attempt has been made to set out all the relevant statistics in a comparable form. The investigation relates to forty-four countries, Great Britain coming first and occupying the largest number of pages, namely, 52, and the information covers production, prices, exports and imports, employment, wages, money rates, etc., etc. All the sources of the figures are given, and a summary table is appended to the account of each country to simplify comparison; an appendix gives tables of monthly figures for eleven countries. We regret that owing to the short time available for inspection of the volume it is not possible at present to make any detailed comment on the contents.

The Banco de la Nación Argentina, following the example of similar institutions in other countries, has instituted a Bureau of Economic Research, under the direction of Professor Raul Prebisch, for the systematic observation of business conditions and the collection of such information as may be of service in guiding those who direct the policy of the central Bank. One interesting outcome of the activities of the Bureau is a monthly publication, *The Economic Review*, of which we have received the first five issues, namely, August to December, 1928. Each number contains surveys of the banking situation and of economic and agricultural conditions, with numerous tables and graphs, also special articles dealing with various activities, such as the beef market (No. 1), joint-stock companies (No. 2), the world wheat market (No. 3). Our copy of the first number, which includes an account of the organization and purposes of the Bureau, is in English, and though the subsequent issues are in Spanish, we understand that it is proposed to publish them later in translation.

Readers will observe that in the tables at the end relating to the Accounts of the Bank of England it has not been possible to take full advantage of the improved form of Return adopted by the Bank from 28 November. It may be briefly noted here that the increases in "notes issued," "notes in the hands of the public," and "other securities in the Issue Department," reflect the amalgamation of the Currency Note issue and the Bank of England Note issue. In the accounts of the Banking Department "Private Deposits" are now divided into "Bankers" and "Other Accounts"; the former entry, representing United Kingdom joint-stock bank balances, was £62,379,000 on 28 November. "Other Securities" are also divided into "Discounts and Advances," representing borrowings by the money market (£13,586,000) on 28 November, and "Securities" (£20,215,000); under the latter heading and that of Government Securities (£52,180,000) are included direct purchases of bills and securities by the Bank on its own account. When the tables for 1929 are constructed it is hoped that it will be possible to show those changes fully.

The Society offers its congratulations to its Honorary Fellow, Professor Paul I. Georgievsky, on the completion of his fifty years of scientific and social work, from the publication of his first book in 1879, which formed the object of a celebration at Prague on January 27th. Professor Georgievsky received the degree of Doctor of Political Economy and Statistics in 1887, and in 1910 was made

Director of the Central Statistical Committee of Russia, becoming President of the Statistical Council in 1914 and a Senator in 1916. The institution of the first Bureau for the Registration of the Poor and the establishment of the first Shelter Colony were among the fruits of his labours. He left Russia after the revolution and in 1922 was appointed Professor of Statistics to the Russian Faculty of the University of Prague, which position he now holds.

The Meetings for study and discussion proposed last year with the object of affording a meeting-ground for younger statisticians took shape during the summer as the Study Group of the Royal Statistical Society, which was duly constituted, with Mr. Norman Crump as Chairman and Mr. A. P. L. Gordon as Honorary Secretary.

The Group meets, at present, on the first Tuesday in each month during the Session, at the Society's premises. The first meeting was held in October, when Mr. Crump gave an inaugural address entitled "Statistics and the Public." The November meeting was given up to a discussion of the future work and constitution of the Watch Committee. At the third meeting, held in December, a paper was read by Mr. H. M. Parkinson on "The Measurement of Stock Exchange Prices Changes." At the January meeting three papers were read: the first, prepared by Mr. C. Craft, dealt with the "Compilation of Foreign Trade Statistics"; the second was read by Mr. R. F. George, and the third by Miss E. J. Bryant, the subjects being "Farm Costing and Farm Business Surveys" and "Business and the Production of Electricity."

The Meetings have all been followed by active discussion, and the amount of interest taken has been very satisfactory.

The activities of the Group include a Watch Committee, the Chairman of which is Mr. G. L. Schwartz. The function of this committee is to keep in touch with current statistical work in all parts of the world, and to make reports to the Group from time to time.

The only constitutional activity of the Group which has not so far been tackled is the foundation of research committees; that is permitted under the Group's constitution, but, apart from the Watch Committee, no special co-operative research has yet been started.

Membership of the Group is open to all Fellows of the Society, and to other statisticians duly elected by the Group and approved by Council: for non-Fellows the annual subscription is ten shillings.

By a resolution of the Council made at their last meeting, papers will no longer be read in full at the Ordinary Meetings of the Society.

Readers of papers will accordingly be asked to prepare an abstract for the purpose of about 2,000 words, which should not take longer than twenty minutes in delivery. Copies of the full text will be available as usual. The object of the new regulation is to afford ample time for discussion without prolonging the meeting to an inconvenient hour.

The Council are offering the Howard Medal for competition again this year. We may recall to Fellows that this award, which fell into abeyance during the war, was instituted in 1873, the centenary of John Howard's appointment as High Sheriff of the County of Bedford, for the presentation of a bronze medal to the author of the best essay on some subject in Social Statistics, preference being given to those topics which Howard himself investigated and illustrated by his labours and writings.

The subject set for this year is

The Statistics of Crime,

and essays must be received on or before the last day of October. The rules of the competition may be obtained from the Assistant Secretary.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Bankers' Magazine—

November, 1928—Banking in Great Britain and Ireland, 1927, No. 4. Proportion of capital and reserves to deposits. Banking, currency, and labour.

December, 1928—Changes at the Bank of England. Bankers and stock exchange speculation: "*Economist*."

January, 1929—The banking year. Fusion of the Treasury and Bank of England notes. Monetary policy and the country's trade.

East India Association, Journal, October, 1928—The Indian linguistic survey and the vernaculars: *Sir Edward Gant, K.C.S.I.* The Indian states and the crown: *Maharaja Dhiraj of Patiala*.

Economica, December, 1928—Some tests of the trustworthiness of public statistics: *A. L. Bowley*. Expenses of production in Great Britain: *F. Brown*.

Economic Journal—

December, 1928—Increasing returns and economic progress: *Prof. Allyn Young*. A mathematical theory of saving: *F. P. Ramsey*. The incidence of taxation in agriculture: *J. A. Venn*. A central bank for India: *Prof. G. Findlay Shirras*. The treatment of price problems: *Prof. G. Cassel*. The present position of skill in industry: *C. G. Renold*.

January, 1929—The population problem during the industrial revolution: *T. H. Marshall*. The pioneers of banking in England: *R. D. Richards*. Theories of the velocity of circulation of money in earlier economic history: *M. W. Holtrop*. Methods of industrial organisation in the west Midlands, 1860–1927: *G. C. Allen*.

Eugenics Review, October, 1928—Heredity and crime: *W. Norwood East*. Scientific bases of birth control: *C. V. Drysdale*. Differential birth-rate analysed: *R. A. Fisher*.

Faculty of Actuaries, Transactions, Vol. XII. Part II. No. 108—The relation between probability and statistics: *W. F. Sheppard*.

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Institute of Bankers, Journal—

December, 1928—Inaugural address of the President : *Frederick Hyde*.

January, 1929—The financial machinery of the City of London : *D. Spring-Rice*.

Ministry of Agriculture, Journal—

November, 1928—Super-English or baby beef : *J. Hunter-Smith and H. W. Gardner*.

December, 1928—The world agricultural census of 1929-30 : *R. J. Thompson*.

January, 1929—A student's impressions of a Danish farm : *J. P. Maule*.

Royal Society of Edinburgh, Proceedings, Vol. XLVIII. Part II—An analysis of preferential voting : *D. M. Y. Somerville*. Studies in clocks and time-keeping, No. 4. The present-day performance of clocks : *Professor R. A. Sampson*.

Secretary, November, 1928—Industry and taxation : *Harold Cox*.

Surveyors' Institution, Journal—

December, 1928—The opening address : *C. R. Fisher*. The recent Rating Acts in operation : *F. G. Fleury*.

January, 1929—The weather and the wheat crops, 1928 : *C. T. Sanctuary*. Some notes on the Charing Cross bridge problem : *A. Norman Garrard*.

Tropical Agriculture, January, 1929—Experimental error : *E. J. Maskell*.

INDIA—

Indian Journal of Economics—

July, 1928—The progress of the steel industry, 1924-27 : *H. L. Dey*. The Royal Commission on agriculture in India and the Indian rural population : *D. L. Sahasrabudhe*. Report of the Royal Commission on agriculture : a Punjab point of view : *E. B. Wakefield*. Labour and the agricultural commission report : *S. K. Rudra*.

October, 1928—Indian agriculture and Indian peasants : *Professor G. Findlay Shirras*. The agricultural commission, 1926-28 : *A. C. Sen Gupta*. The report of the Royal Commission on agriculture in India : *B. C. Bhatnagar*. The Indian tinplate industry : a study in comparative advantages : *H. L. Dey*.

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UNITED STATES—

Actuarial Society of America, Transactions, May, 1928—Inverse interpolation: *Kingsland Camp*. Occupational mortality (discussion): *A. Hunter*. Graduation based on a modification of osculatory interpolation: *W. A. Jenkins*.

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American Statistical Association, Journal—

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Monthly Labor Review—

- August, 1928—Stability of railroad labor : *W. H. Dunlop*. Wages and hours in the manufacture of aluminium ware. Wages and hours in brass and copper mills. Changes in cost of living.
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October, 1928—Co-operation of trade unions with employers. Wages and hours in cotton-goods manufacturing. Entrance wage rates for common labor.
November, 1928—Stability of employment in the iron and steel industry. Average construction cost of dwellings in large cities.

Quarterly Journal of Economics, November, 1928—The Sherman Act : its design and its effect : *M. W. Watkins*. The provision for agricultural credit in the United States : *A. G. Black*.

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EGYPT—

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Internationale Industriekartelle und ihre Bedeutung für die
Gestaltung der weltwirtschaftlichen Beziehungen : *P. Berken-
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vecchiaia nella politica demografica nazionale : *P. Medolaghi*.
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October, 1928—L'organizzazione delle vendite a rate : *G. Angrisani*.
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L'Économiste Roumain, October, 1928—L'industrie du pétrole l'an dernier et cette année.

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LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part IV, 1928, the Society has received the publications enumerated below:—

I.—OFFICIAL PUBLICATIONS.

(a) United Kingdom and its several Divisions.

United Kingdom—

Overseas Trade, Department of—

Reports on Financial and Economic Conditions, etc., as follows: Bulgaria (July, 1928), 1s.; China (Sept., 1928) and Trade of S. Manchuria, 2s. 6d.; Ecuador (Sept., 1928), 1s.; Egypt (May, 1928), 1s. 6d.; Germany (June, 1928), 3s. 6d.; Greece (May, 1928), 2s.; British Trade in India (1927-28), 3s.; Japan (June, 1928), 3s.; Spain (June, 1928), 1s. 6d.; Union of S. Africa, 2s. (The Department.)

Trade, Board of. Production in Great Britain in 1924. Summary of preliminary reports, xvi pp. Board of Trade Journal, Sept., 1928. 6d. (The Board.)

England and Wales—

Health, Ministry of. Reports on public health and medical subjects, No. 51. On the late results of operation for cancer of the breast. vii + 143 pp. London, 1928. 3s. (The Ministry.)

Northern Ireland—

Agriculture, Ministry of. The agricultural output of Northern Ireland, 1925. iii + 77 pp. Belfast, 1928. 2s. 6d. (The Ministry.)

(b) India, Dominions and Protectorates.

India—

Commercial Intelligence and Statistics, Department of. Index numbers of Indian prices, 1861-1926. 24 fol. pp. Calcutta, 1928. 5s. (The Department.)

District Gazetteers. United Provinces of Agra and Oudh. Vol. XXVIII. Jaunpur Dist. 15 annas.; Pilibhit Dist. 8 annas. 2 vols., 1928. (The High Commissioner for India.)

Meteorological Department. Memoirs. Vol. XXV. Part II. Summary of Indian rainfall for the fifty years, 1875-1924. 108 pp. Calcutta, 1928. 13s. 6d. (Central Publication Branch, Govt. of India.)

Bombay Presidency. Gazetteer. Vol. XXII-B. Dharwar and Savanur. ii + 94 pp. Bombay, 1928. 8s. 3d. (High Commissioner for India.)

Labour Office. Report on an enquiry into family budgets of cotton mill workers in Sholapur City. 73 pp. Bombay, 1928. 4s. 9d. (The Office.)

Report on an enquiry into working-class family budgets in Ahmedabad. 48 pp. Bombay, 1928. 5d. (Id.)

Burma. Labour Statistics Bureau. Report of an enquiry into the standard and cost of living of the working classes in Rangoon. v + 221 pp. Burma, 1928. (The Bureau.)

Punjab. Enquiry, Board of. Rural Section Publication No. 19. General Editor, W. H. Myles. Farm accounts in the Punjab, 1926-27. v + 87 pp. Punjab, 1928. 8 annas. (The Board.)

(b) India, Dominions and Protectorates—*Contd.*

Irish Free State—

Industry and Commerce, Department of—

Population, Census of. 1926. Vol. II. Occupations of males and females in each province, county, county borough, urban, and rural district. viii + 228 pp. Dublin, 1928. 2s. 3d. (The Department.)

Production, Census of, 1926. Preliminary reports—No. 10. Linen, cotton, hemp and jute, and canvas industries; 11. Hosiery industry; 12. Bacon curing industry; 13. Sugar, confectionery, and jam-making trades; 14. Chemical, drug, and paint industry; 16. Grain milling industry; 17. Bread, flour, confectionery, and biscuit-making industry; 18. Butter, cheese, and margarine trades. Dublin, 1928. (The Department.)

New Zealand—

Census and Statistics Office. Population census, 1926. Vol. III. Ages. 41 pp. Wellington, 1928. 2s. (The Office.)

(c) Foreign Countries.

Argentina—

Clasificación estadística de la causas de las defunciones. (Nomenclatura internacional de 1920.) vi + 100 pp. Buenos Aires, 1927. (Dirección General de Estadística.)

Nivel general de precios al por mayor en el período 1913-20. 22 pp. Buenos Aires, 1928. (*Id.*)

Bulgaria—

Comptes de ménage. Livre II. Enquête sur les recottes et dépenses des ménages de fonctionnaires, d'artisans, et d'ouvriers. Mars 1925. vi + 261 pp. Sofia, 1928. (Direction Générale de la Statistique.)

Chile—

Resumen de los estados de los bancos del país al 1° Septiembre de 1928. 13 pp. Santiago, 1928. (Superintendencia de Bancos.)

Czechoslovakia—

Balance des paiements. Par Dr. Pavel Smutný. 164 pp. Prague, 1928. 20 Kč. (L'Office de Statistique.)

Czechoslovak sources and documents No. 3. The budget for 1929. 40 pp. Prague, 1928. 7 Kč. (Czechoslovak Legation.)

Recensement de la population. 1921—

Tome II. Partie 2. Moravie et Silésie. xvi + 453 pp. Prague, 1925. 65 Kč. (L'Office de Statistique.)

Partie 3. Slovaquie et Russie subcarpathique. xix + 593 pp. Prague, 1925. 80 Kč. (*Id.*)

Germany—

Statistik des Deutschen Reichs—

Band 353. Die deutsche Umsatzbesteuerung nach dem Kriege, 1925. Berlin, 1928. 24 Rm. (Statistisches Reichsamt.)

Einzelschriften zur Statistik des Deutschen Reichs, Nr. 5. Die Wirtschaft des Auslandes 1900-1927. viii + 910 pp. Berlin, 1928, 28 Rm. (*Id.*)

Sonderhefte zu Wirtschaft und Statistik, Nr. 4. Industrielle Produktionsstatistik. Sammlung produktionsstatistischer Nachkriegszahlen bis zum Jahre 1926 mit Ergänzungen bis zum Jahre 1927. 82 pp. Berlin, 1928. (*Id.*)

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Dutch East Indies—

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Annuaire statistique des villes de Pologne. 1ère année 1928. vi + 86 pp. Warsaw, 1928. (L'Office Central de Statistique.)

Roumania—

Industry and Commerce, Ministry of. The Mines and metallurgical works of the Roumanian Government. 4 parts, 1929. (Roumanian Legation.)

Russia—

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Statistics of traffic on the international waterways and sea-ports of the U.S.S.R. in 1924. Preliminary summary. Moscow, 1925. 32 pp. (*Id.*)

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Censo de población de España en 1920. Tome IV. Clasificación de las mujeres casadas y viudas por la edad y el número de sus hijos. xcii + 521 pp. Madrid, 1928. (Servicio General de Estadística.)

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Farmers' Bulletin No. 1564. Farm budgeting. 22 pp. 1928. 5 cents. (Id.)

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How to use current business statistics. 90 pp. Washington, 1928. 15 cents. (Purchased.)

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70th Congress. House document 332. Income tax in Great Britain. xvi + 226 pp. Washington, 1928. 35 cents. (The Committee.)

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The Bureau: what it is, what it has done, and what it is doing for the children of the United States. 14 pp. 1928. 5 cents. (The Bureau.)

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Labor Statistics, Bureau of—

Bulletins. Nos. 462. Park recreation areas in the United States. iv + 95 pp. 1928. 25 cents. (The Bureau.) 466. Settlement for accidents to American seamen. 101 pp. 1928. 20 cents. (Id.) 478. Proceedings of the 15th annual meeting of the International Association of Public Employment Services. 36 pp. 1928. 10 cents. (Id.) 479. Activities and functions of a State Department of Labor. 159 pp. 1928. 25 cents. (Id.)

Women's Bureau. Bulletin No. 64. The employment of women at night. 86 pp. 1928. 15 cents. (Id.)

(d) International.

League of Nations—

Economic and Financial Section—

Aperçu des moyens directs et indirects mis dans les divers pays à la disposition des acheteurs étrangers pour s'assurer de la qualité des marchandises dont ils deviennent acquéreurs dans ces pays. 136 fol. pp. Geneva, 1928. (The League.)

Bulgarian stabilisation loan. Protocol and annexes approved by the Council of the League. 57 fol. pp. Geneva, 1928. (Id.)

Double taxation and fiscal evasion. General meeting of Government experts. 18 fol. pp. Geneva, 1928. (Id.)

Report presented by the General Meeting. 39 pp. Geneva, 1928. 1s. 6d. (Id.)

(d) *International—Contd.***League of Nations—Contd.****Economic and Financial Section—**

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REVENUE OF THE UNITED KINGDOM.

*Net Produce in Quarters of 1928, and in Financial Years ended
March 31, 1927-28, 1926-27, 1925-26, 1924-25.*

(000's omitted.)

QUARTERS, ended	March 31, 1928.	June 30, 1928.	Sept. 30, 1928.	Dec. 31, 1928.	Total for calendar year 1928.
	£	£	£	£	£
Customs	27,217	27,058	31,892	31,151	117,621
Excise	32,849	31,815	32,985	38,935	136,584
Stamps and Estate Duties	31,810	24,070	30,140	26,610	112,630
Land Tax, House Duty and Mineral Rights Duty	640	180	80	10	810
Postal Service	10,080	15,400	16,100	16,700	64,900
Telegraph Service	1,850				
Telephone Service	4,800				
	109,016	98,478	111,147	113,700	432,341
Property and Income Tax, in- cluding Supertax	194,463	29,373	86,916	24,362	285,016
	303,479	127,848	118,063	137,971	717,361
Excess Profits Duties, etc.	500	210	190	180	1,080
Corporation Profits Tax	15,654	4,117	3,259	2,214	25,271
Motor Vehicle Duties	180	230	840	350	1,110
Crown Lands	6,473	6,059	8,317	5,918	26,765
Interest on Sundry Loans					
Miscellaneous—					
Ordinary receipts	14,219	2,447	2,133	7,097	25,896
Special receipts	9,595	4,619	4,563	19,439	38,316
Totals	850,310	145,560	166,865	173,197	835,832

YEARS, ended March 31,	1927-28.	1926-27.	1927-28 (compared with 1926-27).		Corresponding years.	
			Increas.	Decreas.	1925-26.	1924-25.
	£	£	£	£	£	£
Customs	111,620	107,515	4,105	—	103,187	99,311
Excise	189,200	132,978	6,222	—	131,560	135,128
Stamps and Estate Duties	104,840	92,070	12,770	—	85,900	82,300
Land Tax, House Duty and Mineral Rights Duty	780	880	—	100	950	1,150
Postal Service	38,250	35,600	2,650	—	35,750	34,850
Telegraph Service	6,100	5,900	200	—	5,650	5,000
Telephone Service	18,660	17,350	1,300	—	15,950	15,000
	418,040	392,293	26,747	100	382,217	373,672
Property and Income Tax, including Super-tax	311,188	300,627	10,566	—	337,921	336,510
	730,128	692,920	37,303	100	710,168	710,188
Excess Profits Duties, etc.	4,500	4,500	—	4,500	2,000	700
Corporation Profits Tax	1,780	3,970	—	2,190	11,670	18,100
Motor Vehicle Duties	24,518	21,393	3,125	—	18,058	16,161
Crown Lands	1,070	1,010	60	—	950	960
Interest on Sundry Loans	23,982	22,884	1,098	—	11,911	11,941
Miscellaneous—						
Ordinary receipts	30,893	28,214	2,679	—	17,319	11,119
Special receipts	30,488	30,840	—	352	36,921	26,963
Totals	842,824	805,701	44,265	7,142	812,061	799,435
			NET INC. £37,123			

Values (c.i.f. of Imports* into the United Kingdom for the years 1926-27-28.

(From the Monthly Trade Returns, December, 1928.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1928 as compared with 1927.	Increase (+) or Decrease (-) in 1928 as compared with 1926.
	1926.	1927.	1928.		
I. FOOD, DRINK AND TOBACCO—	£	£	£	£	£
A. Grain and flour	99,112,741	110,969,996	97,637,377	-13,332,619	+ 1,475,864
B. Feeding-stuffs for animals	6,801,999	8,418,242	6,185,873	+ 787,633	+ 2,380,876
C. Meat	114,267,486	103,484,070	108,248,909	+ 5,764,839	- 5,018,557
D. Animals, living, for food	16,981,844	16,510,297	16,034,355	+ 524,038	- 947,559
E. Other food and drink, non-dutiable	186,401,733	164,741,934	173,879,043	+ 9,137,109	+ 7,477,811
F. Other food and drink, dutiable	108,606,308	116,343,609	108,101,788	- 8,141,826	- 403,585
G. Tobacco	17,714,291	19,178,478	17,826,215	- 1,353,263	+ 110,924
Total, Class I	529,788,541	588,526,621	581,812,457	- 6,614,064	+ 2,124,016
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal	42,888,845	6,611,420	30,496	- 6,571,924	- 42,844,340
B. Other non-metallic Mining and quarry products and the like	5,566,747	6,268,322	5,600,703	- 651,619	+ 40,066
C. Iron ore and scrap	2,776,819	5,702,578	4,822,481	- 880,094	+ 2,045,665
D. Non-ferrous metalliferous ores and scrap	15,220,139	15,700,099	16,512,609	+ 842,510	+ 1,313,470
E. Wood and timber	39,259,493	49,066,787	42,566,318	- 7,101,544	+ 3,805,750
F. Raw cotton and cotton waste	81,118,856	67,754,004	80,707,091	+12,952,417	- 3,711,333
G. Wool, raw, and waste, and woollen rags	65,114,153	83,816,344	68,922,392	+ 106,576	- 1,521,233
H. Silk, raw, knits and noils	2,022,309	1,828,518	1,899,087	+ 71,449	- 122,309
I. Other textile materials	13,513,232	16,131,464	16,981,365	+ 2,160,099	+ 438,183
J. Oil seeds, nuts, oils, fats, resins and gums	45,478,035	45,090,534	44,716,420	- 344,114	- 781,615
K. Hides and skins, undressed	10,506,829	23,018,506	26,057,408	+ 3,038,897	+ 6,550,574
L. Paper-making materials	11,912,667	12,788,863	10,151,792	- 2,637,071	- 1,790,875
M. Rubber	33,495,016	25,417,228	11,889,380	-13,577,868	- 21,656,666
N. Miscellaneous raw materials and articles mainly un- manufactured	10,587,856	11,954,452	11,986,907	- 17,545	+ 1,349,051
Total, Class II	392,183,456	351,789,719	334,819,890	-16,920,329	- 57,363,766
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Coke and manufactured fuel	2,515,811	134,906	8,609	- 126,297	- 2,506,285
B. Pottery, glass, abrasives, &c.	11,510,093	11,865,882	10,895,439	- 970,453	- 614,604
C. Iron and steel and manu- factures thereof	29,512,158	31,032,026	24,158,192	- 9,873,534	- 5,353,066
D. Non-ferrous metals and manufactures thereof	37,096,791	32,592,542	33,115,018	+ 522,476	- 3,981,773
E. Cutlery, hardware, imple- ments, and instruments	6,589,185	7,304,611	7,632,408	+ 327,764	+ 1,043,923
F. Electrical goods and apparatus	3,787,290	4,256,683	4,711,335	+ 454,503	+ 924,045
G. Machinery	12,782,870	16,019,040	16,731,415	+ 812,369	+ 3,918,506
H. Manufactures of wood and timber	6,769,445	7,313,937	8,425,859	+ 1,111,922	+ 1,626,414
I. Cotton yarns and manu- factures	8,652,129	9,915,407	10,732,848	+ 817,441	+ 2,080,710
J. Woollen and worsted yarns and manufactures	14,977,317	16,096,809	17,388,115	+ 1,191,306	+ 2,310,798
K. Silk and silk manufactures	16,833,857	16,181,101	14,465,141	- 1,716,020	- 2,368,710
L. Manufactures of other textile materials	14,949,817	15,784,605	15,013,807	- 171,358	+ 662,490
M. Apparel	17,183,268	18,059,308	19,606,026	+ 946,718	+ 2,422,768
N. Chemicals, drugs, dyes and colours	15,448,098	15,502,422	15,367,796	- 134,626	- 80,902
O. Oils, fats and resins, manu- factured	48,875,255	38,820,362	37,822,129	- 798,233	- 6,053,126

* The value of the Imports represents the cost, insurance and freight; or, when goods are consigned for sale, the latest sale value of such goods.

Values (c.i.f.) of Imports for the years 1926-27-28—Contd.

(From the Monthly Trade Returns, December, 1928.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1928 as compared with 1927.	Increase (+) or Decrease (-) in 1928 as compared with 1926.
	1926.	1927.	1928.		
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—Contd.					
P. Leather and manufactures thereof	£ 14,072,966	£ 16,759,934	£ 19,506,931	+ 2,746,997	+ 5,433,965
Q. Paper and cardboard	15,717,699	16,429,946	17,268,091	+ 840,045	+ 1,552,392
R. Vehicles (including locomotives, ships and aircraft)	12,259,315	12,180,721	9,565,849	- 2,565,872	- 2,694,466
S. Rubber manufactures	2,770,326	2,591,633	3,349,368	+ 757,665	+ 579,012
T. Miscellaneous articles, wholly or mainly manufactured	27,348,183	30,320,306	31,719,859	+ 1,429,553	+ 4,401,076
Total, Class III	314,682,305	322,412,540	318,016,455	- 4,390,085	+ 3,331,150
IV. ANIMALS, NOT FOR FOOD	2,154,784	2,653,196	3,061,520	+ 411,324	+ 906,736
V. PARCEL POST, NON-DUTIABLE ARTICLES	2,553,191	3,009,074	9,127,133	+ 6,118,058	+ 6,571,911
Total	1,341,361,377	1,278,341,160	1,196,940,354	- 21,100,796	- 11,420,023

Values (f.o.b.) of Exports* of British and Irish Produce and Manufactures for the years 1926-27-28.

(From the Monthly Trade Returns, December, 1928.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1928 as compared with 1927.	Increase (+) or Decrease (-) in 1928 as compared with 1926.
	1926.	1927.	1928.		
I. FOOD, DRINK AND TOBACCO—					
A. Grain and flour	£ 5,792,095	£ 5,597,815	£ 5,333,013	- 259,802	- 454,082
B. Feeding-stuffs for animals ..	2,386,970	2,965,301	3,333,116	+ 377,725	+ 946,146
C. Meat	1,640,812	1,669,533	1,629,978	- 39,555	- 10,834
D. Animals, living, for food	146,553	142,261	173,728	+ 30,467	+ 26,175
E. and F. Other food and drink ..	32,126,680	33,508,977	31,431,135	- 2,077,842	- 2,007,486
G. Tobacco	8,061,231	8,401,526	9,363,791	+ 959,265	+ 1,302,560
Total, Class I	50,457,311	52,278,502	54,371,761	+ 1,993,259	+ 3,814,450
II. RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED—					
A. Coal	19,187,106	45,530,795	39,061,641	- 6,469,154	- 10,921,538
B. Other non-metallic mining and quarry products and the like	1,916,658	1,895,651	1,898,810	+ 3,159	+ 17,842
C. Iron ore and scrap	285,459	877,620	1,104,564	+ 226,944	+ 819,105
D. Non-ferrous metalliferous ores and scrap	1,677,913	1,949,330	1,785,722	- 163,608	+ 207,779
E. Wood and timber	639,804	589,788	445,980	- 143,808	- 193,824
F. Raw cotton and cotton waste ..	1,041,426	1,217,901	1,382,018	+ 164,117	+ 341,192
G. Wool, raw, and waste, and woollen rags	8,453,290	10,471,194	10,390,034	- 81,160	+ 1,536,744
H. Silk, raw, knurms and rolls ..	24,413	73,382	87,508	+ 14,126	+ 13,095
I. Other textile materials	292,201	233,489	540,757	+ 307,268	+ 248,406
J. Oil seeds, nuts, oils, fats, resins and gums	6,221,032	5,449,147	5,378,994	- 70,153	- 842,088
K. Hides and skins, undressed ..	2,395,541	2,579,480	3,082,710	+ 503,230	+ 693,175
L. Paper-making materials	1,524,953	1,367,393	1,429,547	+ 62,154	+ 95,406
M. Rubber	507,160	293,276	255,618	- 37,658	- 51,547
N. Miscellaneous raw materials and articles mainly unmanufactured	3,345,225	3,874,800	3,468,019	- 406,781	+ 122,794
Total, Class II	47,162,351	76,352,169	70,168,532	- 6,183,637	+ 23,006,181

* The value of the Exports represents the cost and the charges of delivering the goods on board the ship, and is known as the "free on board" value.

Values (f.o.b.) of Exports for the years 1926-27-28—Contd.

(From the Monthly Trade Returns, December, 1923.)

	Year ended December 31,			Increase (+) or Decrease (-) in 1928 as compared with 1927.	Increase (+) or Decrease (-) in 1928 as compared with 1926.
	1926.	1927.	1928.		
	£	£	£	£	£
III. ARTICLES WHOLLY OR MAINLY MANUFACTURED—					
A. Ooke and manufactured fuel	1,862,918	3,656,561	3,671,419	+ 14,858	+ 2,808,501
B. Pottery, glass, abrasives, &c.....	11,914,080	13,011,648	13,070,308	+ 64,655	+ 1,162,223
C. Iron and steel and manufactures thereof	55,080,875	69,383,416	66,801,570	- 2,581,846	+ 11,740,695
D. Non-ferrous metals and manufactures thereof	19,469,037	19,862,012	16,373,738	- 3,488,274	- 3,095,299
E. Cutlery, hardware, implements and instruments ...	8,801,466	8,828,534	9,137,005	+ 309,071	+ 336,139
F. Electrical goods and apparatus	13,365,894	11,878,273	11,639,139	- 249,136	- 1,736,755
G. Machinery	46,686,987	49,920,343	53,749,131	+ 3,828,288	+ 8,062,144
H. Manufactures of wood and timber	2,123,310	2,816,957	2,502,780	+ 185,833	+ 379,480
I. Cotton yarns and manufactures	164,310,912	148,794,942	145,304,242	- 3,490,700	- 9,036,700
J. Woollen and worsted yarns and manufactures	51,312,675	56,755,955	56,896,582	+ 140,627	+ 5,583,907
K. Silk and silk manufactures	1,953,498	2,426,087	2,406,061	- 20,026	+ 452,563
L. Manufactures of other textile materials	26,741,362	27,060,722	29,494,139	+ 2,408,417	+ 2,719,777
M. Apparel	27,318,069	26,824,536	26,182,731	+ 358,195	- 1,139,938
N. Chemicals, drugs, dyes and colours	21,659,716	23,402,723	25,414,223	+ 2,011,500	+ 3,754,507
O. Oils, fats and resins, manufactured	9,447,081	9,163,860	8,955,593	- 207,268	- 491,489
P. Leather and manufactures thereof	6,670,883	8,344,063	9,869,946	+ 1,025,878	+ 2,698,064
Q. Paper and cardboard	9,789,353	9,132,364	9,292,897	+ 160,533	- 496,456
R. Vehicles (including locomotives, ships and aircraft)	35,106,563	35,414,273	46,965,401	+ 11,551,128	+ 11,858,838
S. Rubber manufactures	3,422,372	3,397,629	3,444,968	+ 147,339	+ 22,596
T. Miscellaneous articles wholly or mainly manufactured	33,789,255	35,458,877	37,990,042	+ 2,531,165	+ 4,200,787
Total, Class III	539,340,035	563,913,782	578,628,519	+ 14,714,737	+ 39,287,534
IV. ANIMALS, NOT FOR FOOD	1,710,720	1,898,016	1,995,333	+ 97,317	+ 278,613
V. PARCEL POST	14,360,592	14,638,794	18,363,310	+ 2,724,516	+ 3,993,718
Total	653,046,909	709,081,268	723,427,455	+ 14,346,192	+ 70,880,546

BANK OF ENGLAND.
Pursuant to the Act 7th and 8th Victoria, cap. 32 (1844),
 (000's omitted.)

1	2	3	4	5	6	7
ISSUE DEPARTMENT.					COLLATERAL COLUMNS.	
Liabilities.	DATES. (Wednesdays.)	Assets.			Notes in Hands of Public. (Col. 1 minus col. 16.)	Minimum Discount Rates at Bank of England.
Notes Issued.		Government Debt.	Other Securities.	Gold Coin and Bullion.		
£	1928.	£	£	£	£	Per cent. ½
171,162	Jan. 4.....	11,015	8,735	161,412	137,728	
173,194	" 11.....	11,015	8,735	164,164	135,934	
174,421	" 18.....	11,015	8,735	164,671	134,749	
175,045	" 25.....	11,015	8,735	165,295	134,640	
174,748	Feb. 1.....	11,015	8,735	161,998	135,836	
176,475	" 8.....	11,015	8,735	166,725	135,270	
176,887	" 15.....	11,015	8,735	167,167	134,282	
176,886	" 22.....	11,015	8,735	157,086	134,068	
176,150	" 29.....	11,015	8,735	166,400	135,349	
176,733	Mar. 7.....	11,015	8,735	159,983	135,115	
176,662	" 14.....	11,015	8,735	160,012	134,402	
176,544	" 21.....	11,015	8,735	166,794	134,392	
177,044	" 28.....	11,015	8,735	167,261	135,409	
175,920	Apr. 4.....	11,015	8,735	156,170	136,605	
176,361	" 11.....	11,015	8,735	159,001	135,560	
177,138	" 18.....	11,015	8,735	167,888	134,659	
178,914	" 25.....	11,015	8,735	169,104	134,743	
179,066	May 2.....	11,015	8,735	159,316	135,756	
180,077	" 9.....	11,015	8,735	160,327	135,218	
180,004	" 16.....	11,015	8,735	160,264	131,834	
180,098	" 23.....	11,015	8,735	160,378	135,061	
180,600	" 30.....	11,015	8,735	160,660	135,985	
181,098	June 6.....	11,015	8,735	161,878	135,662	
186,468	" 13.....	11,015	8,735	165,713	135,074	
188,897	" 20.....	11,015	8,735	169,147	135,027	
189,384	" 27.....	11,015	8,735	169,634	136,256	
190,436	July 4.....	11,015	8,735	170,686	137,166	
191,368	" 11.....	11,015	8,735	171,008	136,361	
192,904	" 18.....	11,015	8,735	173,161	135,891	
192,978	" 25.....	11,015	8,735	173,223	136,016	
190,611	Aug. 1.....	11,015	8,735	170,691	137,216	
191,427	" 8.....	11,015	8,735	171,677	136,778	
191,160	" 15.....	11,015	8,735	171,439	135,794	
191,822	" 22.....	11,015	8,735	172,072	134,921	
192,904	" 29.....	11,015	8,735	173,161	135,412	
193,047	Sept. 5.....	11,015	8,735	173,897	135,368	
193,667	" 12.....	11,015	8,735	173,907	134,607	
193,187	" 19.....	11,015	8,735	173,437	133,773	
190,320	" 26.....	11,015	8,735	170,670	134,495	
185,477	Oct. 3.....	11,015	8,735	165,727	135,007	
184,930	" 10.....	11,015	8,735	165,180	131,191	
184,839	" 17.....	11,015	8,735	165,109	133,501	
184,768	" 24.....	11,015	8,735	165,008	133,178	
183,207	" 31.....	11,015	8,735	163,467	134,502	
183,485	Nov. 7.....	11,015	8,735	163,745	133,936	
181,186	" 14.....	11,015	8,735	161,436	133,314	
180,964	" 21.....	11,015	8,735	161,314	132,803	
419,089*	" 28.....	11,015	248,985†	169,089	367,001	
417,831	Dec. 5.....	11,015	248,985	167,831	371,156	
416,654	" 12.....	11,015	248,985	166,651	374,821	
415,211	" 19.....	11,015	248,985	165,211	384,111	
413,784	" 26.....	11,015	248,985	163,784	388,243	

* Including £1 and 10s. notes.

† Including silver coin.

WEEKLY RETURN.

for Wednesday in each Week, during the Year 1928

(000's omitted)

9	9	10	11	12	13	14	15	16	17	18
BANKING DEPARTMENT.										
Liabilities					DATE (Wednesdays)	Assets				Totals of Liabilities and Assets
Capital and Reserve		Deposits		Seven Day and other Bills		Securities		Reserve		
Capital	Reserve	Public	Private			Government	Other	Notes	Gold and Silver Coin	
£	£	£	£	£	1928	£	£	£	£	£
11,553	3,131	13,618	112,730		Jan 4	48,294	91,716	33,434	891	174,335
11,553	3,180	14,854	110,061	3	" 11	39,629	64,504	37,980	888	142,951
11,553	3,602	19,201	100,111	1	" 18	36,494	60,366	38,672	869	137,391
11,553	3,516	26,526	98,707	3	" 25	33,300	56,717	40,406	908	133,335
11,553	3,515	11,311	97,563	3	Feb 1	35,258	55,027	38,913	880	130,078
11,553	3,607	15,351	97,805	3	" 5	36,876	53,197	41,206	840	130,819
11,553	3,106	11,970	101,116	2	" 12	36,210	52,508	42,656	809	132,268
11,553	3,151	11,033	91,518	2	" 19	31,303	52,276	12,768	831	127,778
11,553	3,719	10,110	105,507	2	" 26	30,683	51,587	40,801	860	126,921
11,553	3,720	8,162	102,579	3	Mar 5	31,762	55,322	11,618	915	129,617
11,553	3,712	9,770	101,611	2	" 12	31,507	56,982	42,280	941	131,690
11,553	3,749	14,111	101,571	4	" 19	31,579	58,130	42,163	89	134,021
11,553	3,713	13,735	98,215	3	" 26	30,821	56,878	41,596	876	130,173
11,553	3,091	25,998	88,881	2	Apr 2	31,790	57,351	39,315	1,075	132,531
11,553	3,117	17,800	100,110	3	" 9	31,121	62,690	40,791	1,102	137,693
11,553	3,116	17,501	100,135	1	" 16	31,721	60,190	42,478	1,231	135,621
11,553	3,119	17,956	94,810	2	" 23	29,063	55,932	41,171	1,302	130,470
11,553	3,111	13,680	101,110	3	May 7	31,365	56,697	43,310	1,415	132,807
11,553	3,175	13,073	100,783	5	" 14	29,168	55,695	44,858	1,579	131,590
11,553	3,187	19,165	96,377	4	" 21	29,677	55,846	45,170	1,633	132,286
11,553	3,209	13,096	100,618	1	" 28	28,882	54,925	41,964	1,909	131,380
11,553	3,211	22,284	89,669	1	" 30	28,968	53,985	44,615	2,072	129,620
11,553	3,252	8,852	110,273	4	June 4	36,187	52,579	45,966	2,203	136,934
11,553	3,281	18,211	102,793	3	" 11	31,440	51,668	50,389	2,387	138,884
11,553	3,113	21,133	94,111	4	" 18	31,611	52,378	53,870	2,514	140,455
11,553	3,103	23,873	105,591	6	" 25	30,770	60,668	53,128	2,668	147,428
11,553	3,150	19,687	116,820	3	July 2	28,789	79,711	53,370	2,712	164,522
11,553	3,191	16,210	101,703	3	" 9	30,129	50,188	54,997	2,749	138,963
11,553	3,195	16,389	106,991	3	" 16	11,364	10,210	57,013	2,790	141,132
11,553	3,619	11,537	106,548	5	" 23	28,270	18,118	56,967	2,798	136,452
11,553	3,660	12,171	101,510	1	Aug 6	29,201	48,121	53,428	2,765	133,818
11,553	3,661	12,911	101,511	3	" 13	29,062	49,099	54,149	2,765	131,565
11,553	3,594	13,080	101,111	3	" 20	28,672	47,081	55,395	2,708	133,856
11,553	3,661	16,612	97,491	5	" 27	27,061	15,093	56,901	2,762	132,715
11,553	3,672	19,229	96,101	2	" 30	31,110	43,444	57,103	2,713	132,760
11,553	3,721	18,486	109,185	1	Sept 3	37,736	47,147	58,279	2,679	146,151
11,553	3,719	13,074	94,881	7	" 10	27,116	11,396	59,030	2,677	130,269
11,553	3,770	15,888	100,801	6	" 17	28,016	11,899	59,411	2,643	135,021
11,553	3,726	9,911	103,712	3	" 24	31,682	47,578	55,825	2,635	131,720
11,553	3,739	10,006	103,116	4	Oct 1	37,110	40,668	50,470	2,500	130,748
11,553	3,108	13,931	97,763	1	" 8	31,110	15,183	50,787	2,321	129,351
11,553	3,111	11,217	100,013	6	" 15	34,015	17,490	51,268	2,038	128,901
11,553	3,148	10,124	103,170	5	" 22	37,300	39,391	51,550	1,729	130,000
11,553	3,130	14,133	103,513	6	" 29	42,623	42,562	48,705	1,404	135,354
11,553	3,160	17,739	90,589	6	Nov 7	44,553	36,690	49,559	1,245	135,047
11,553	3,175	15,543	99,417	3	" 14	44,858	39,460	47,841	1,031	133,601
11,553	3,101	14,898	98,173	3	" 21	48,340	34,757	18,161	671	132,130
11,553	3,251	21,452	89,565	3	" 28	52,180	33,801	52,068	787	136,826
11,553	3,281	8,601	114,938	3	Dec 5	62,870	30,507	46,375	714	141,464
11,553	3,312	7,639	104,116	1	" 12	59,107	28,191	41,393	537	139,672
11,553	3,116	11,113	91,212	2	" 19	57,787	36,113	31,100	586	125,306
11,553	3,161	12,909	107,002	2	" 26	67,297	14,786	26,611	283	137,907

FOREIGN EXCHANGES.—*Quotations as under, LONDON on Paris, Berlin and Calcutta; New York and Hong Kong on LONDON, 1928.*

DATE (Wednesdays.)	1	2	3	4	5	6		7
	London on Paris.	London on Berlin.	London on Calcutta.	New York on London.	Hong Kong on London.	Price per Ounce.		
	Cables (middle rate).	Cables (middle rate).	Demand (middle rate).	Cables (closing rate).	T.T.	Gold Bars (fine).	Silver Standard Bars, (cash).	
1928.	<i>f. c.</i>	<i>Reich- marks.</i>	<i>s. d.</i>	<i>\$ c.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	
Jan. 4.....	124.00	20.45½	1.6½	4.87	2.07½	84.11½	2.27½	
„ 18.....	124.00	20.46½	1.6½	4.87	2.0½	84.11	2.27½	
Feb. 1.....	124.00	20.44	1.6½	4.87	2.0½	84.11½	2.2½	
„ 15.....	124.00	20.43½	1.5½	4.87	2.0½	84.11	2.2½	
„ 29.....	124.00	20.43	1.5½	4.87	2.0½	84.11	2.2½	
Mar. 14.....	124.00	20.41	1.6	4.87	2.0½	84.11	2.2½	
„ 28.....	124.00	20.41	1.5½	4.88	2.0½	84.11½	2.2½	
Apr. 11.....	124.00	20.41	1.5½	4.88	2.0½	84.11½	2.2½	
„ 25.....	124.00	20.41	1.6	4.88	2.0½	84.11	2.2½	
May 9.....	124.00	20.40	1.6	4.88	2.0½	84.11½	2.3½	
„ 23.....	124.02	20.39½	1.6	4.88	2.1½	84.11½	2.4½	
June 6.....	124.15½	20.43½	1.5½	4.88	2.1½	84.10½	2.3½	
„ 20.....	124.19½	20.41½	1.5½	4.87 (21st)	2.0½	84.10	2.3½	
July 4.....	124.1½	20.41½	1.5½	Holiday	2.0½	84.10½	2.3½	
„ 18.....	124.23½	20.37½	1.5½	4.86	2.0½	84.10½	2.3½	
Aug. 1.....	124.00½	20.34½	1.5½	4.85	2.0½	84.11½	2.3½	
„ 15.....	124.26½	20.37	1.5½	4.85	2.0½	84.11½	2.3½	
„ 29.....	124.26½	20.35½	1.5½	4.85	2.0½	84.11½	2.2½	
Sept. 12.....	124.22½	20.36½	1.5½	4.85	2.0½	84.11½	2.2½	
„ 26.....	124.06	20.34½	1.5½	4.84	2.0½	84.11½	2.2½	
Oct. 10.....	124.21½	20.38½	1.6½	4.85	Holiday	84.11½	2.2½	
„ 24.....	124.19	20.35½	1.6½	4.85	2.0½	84.11½	2.2½	
Nov. 7.....	124.15	20.35½	1.6½	4.84	2.0½	84.11½	2.2½	
„ 21.....	124.12½	20.35½	1.6½	4.85	2.0½	84.11½	2.2½	
Dec. 5.....	124.16	20.35½	1.6½	4.85	2.0½	84.11½	2.2½	
„ 19.....	124.3½	20.35½	1.6½	4.85	2.0½	84.11½	2.2½	

JOURNAL

OF THE ROYAL STATISTICAL SOCIETY

PART II, 1929.

DISCUSSION ON THE NATIONAL INCOME.

[Held before the Royal Statistical Society, January 15, 1929, the President,
Mr. A. W. FLUX, C.B., in the Chair.]

THE PRESIDENT said that in accordance with the wish of the Council he had, in order to refresh the memories of those who were present at the November meeting, prepared a table setting out the different stages of the calculation of the National Income as represented in his Address at that meeting. This table is given below.

National Income of the United Kingdom, 1924. *Goods and Services.*

						£ Millions.
Materials available	...	...	...	...	...	848 ± 19
Net Output of Industry	...	...	...	...	...	1630
Goods ready for use—Agricultural	...	...	...	...	...	177 ± 1
						<hr/>
Total production	...	...	...	...	...	2655 ± 20
Exports (at place of production)	...	...	...	...	...	710 ± 15
						<hr/>
Balance of home production	...	...	...	...	...	1945 ± 35
Goods ready for use—Imported	...	...	...	...	...	463
Import and Export Duties	...	...	...	...	...	227
						<hr/>
Total for Distribution	...	...	...	...	...	2635 ± 35
Charges of Distribution	...	...	...	...	...	945 ± 185
						<hr/>
Allowed for Depreciation	...	...	...	...	...	3580 ± 220
	...	...	...	...	...	305 ± 5
						<hr/>
New Goods in Consumers' hands	...	...	...	...	...	3275 ± 225
Services	...	...	...	...	...	650 ± 50
Income arising abroad and invested abroad	...	...	...	...	...	50
						<hr/>
Total	...	...	...	...	...	3975 ± 275
						<hr/>

After referring in rapid succession to the various stages of the calculation, the President called on Dr. Bowley to open the discussion on "The National Income."

PROFESSOR A. L. BOWLEY: When the Council of the Royal Statistical Society invited me to open this discussion, no doubt they had in mind the studies of the National Income which Sir Josiah Stamp and I made for the same year (1924) as the recently published Census of Production, and an earlier one relating to the date 1911 (The Division of the Product of Industry), and presumably they expected me to compare these studies with the estimates which the Society heard last November in the Presidential address. To this question, therefore, I first turn.

Before proceeding to any detail I wish to call attention to the remarkable agreement between the results. For 1911 I estimated the National Income of the United Kingdom as between £2,050 million and £2,150 million; to Mr. Flux's estimates for 1907 we should add about 5 per cent. to allow for the lapse of four years, and so we obtain the range of £2,000 million to £2,250 million. For 1924 Sir Josiah Stamp and I took more than one definition of income; that which corresponds most closely with Mr. Flux's is "Social Income," which we put as between £3,700 million and £3,900 million; Mr. Flux reaches the limits £3,750 million and £4,200 million.* Though no doubt the central figures within these margins, viz. £3,500 million and £3,975 million, are regarded by the authors as the most probable, yet there is no pretence that precision can be reached. Estimates so expressed are quite consistent with each other if the margins overlap, as they do very comfortably.

Now, except for the estimate for Personal Services, etc., which forms one-sixth of Mr. Flux's total, the sources of the estimates are quite distinct. My calculations depend on the returns of Income Tax payers, on the voluntary statements of wages paid by employers (reported to the Board of Trade in 1906 and to the Ministry of Labour in 1924), on recorded changes of wages, on enquiries by sample about intermediate incomes, and on the Population Censuses of 1911 and 1921. Mr. Flux bases his calculations on the compulsory returns of the value of goods produced in connection with the Censuses of Production, and on estimates of the costs of dealing and transport,

* For this discussion Mr. Flux's statistics have been rearranged as follows:—

Net output :					£ million.
Industry	...	...	...	...	1,630
Agriculture	...	...	...	...	241
Waste products	...	...	...	...	16
Distribution and dealing :					
Imports to factories	...	...	...	...	94
Exports to ports	...	...	...	...	89
Foods to customers	...	...	...	...	945
Customs and excise	...	...	...	...	227
Houses and services	...	...	...	...	650
Excess of imports	...	...	...	...	338
Increase of capital abroad	...	...	...	...	45
					<hr/>
					4,275
Less depreciation	...	...	...	...	300
					<hr/>
National income	...	...	...	...	<u>3,975</u>

with an allowance for depreciation. A very wide range of public statistics and of unofficial enquiries is therefore involved, and these depend not only on departmental organization, but also and primarily on the returns made by the mass of individuals on the Census Householder's Schedule and in response to the Income Tax inquisition, and by employers, voluntarily about wages, compulsorily about production. An infinity of points of definition, minor and major, is also involved. The marked consilience of the results should give confidence in the general body of public statistics, in the efficiency of those responsible for them, and in the veracity of the public. The margin of uncertainty assigned shows, on the other hand, that completeness and perfection have not been reached.

Though this general statement that the margins allowed in the two classes of estimates have a considerable overlap remains true, yet closer analysis shows that the two methods do not depend on identical definitions and that the agreement is not so close as appears. I venture to argue that the method employed by Sir Josiah Stamp and myself, that of adding up incomes, is the more accurate for the purpose of estimating total income than is the method based on the Census of Production, the original purpose of which is quite different. In fact, of the £4,200 million in the major total (aggregate income) which we reached, more than half is comprised in definite statements of income assessed to tax, more than a quarter is based on adequate reports on earnings, and only one-sixth depends on a very rough estimate of intermediate earnings. The final margin of error we allow is due much more to difficulties of definition and interpretation and adjustment than to lack of information. On the other hand, in the alternative estimate, less than one-half depends on the information actually obtained in the Census of Production. Of the total (£4,000 million), more than one quarter (£1,100 million) is based on very rough estimates of the cost of transport and dealing—estimates for which no data are given—one-sixth depends on an unsubstantial estimate of the annual value of personal services, etc., and a small item arises from the very difficult and uncertain estimate of the balance of trade. I agree entirely with the President that "the fact that it is in reference to different elements that estimates are necessary, for lack of ascertained data, in the different methods, is itself by no means without value as a safeguard against erroneous results"; in fact, I should go farther and say that I have little confidence in any complex statistics of this class, unless they can be approached from more than one standpoint and from independent groups of data. Thus in the estimate of National Capital it is of the greatest importance to control the estimate by the capitalization of income by that of estates passing at death. But in this case I regard the aggregating of incomes as the primary method, and the aggregating of goods produced and services rendered as the control. The control suggests that we did not *over-estimate* income.

I proceed to consider the statistics in more detail. The objective is to measure "social income," which equals consumption and saving in a year, and also equals the aggregate of individual and collective

incomes, less incomes received by compulsory deductions from other incomes in return for no services or services not rendered in the year. This total also equals the value of goods produced and services rendered within the United Kingdom in a year, plus the value of payments due from outside the country, minus those due from the country to outside, in the same year. The last form of the definition may, I think, be taken to be that used by the President.

The net output of industry and agriculture (£1,871 million in 1924), as we are told in the Final Report of the First Census of Production (p. 8), "constitutes for any industry the fund from which wages, salaries, rent, royalties, rates, taxes, depreciation, advertisement and sales expenses, and all other similar charges have to be defrayed, as well as profits." Of these items, wages, salaries, rent, royalties, and profits are personal (or collective) incomes, and form an essential part in the alternative reckoning of income. For taxes (apart from excise, which apparently is already deducted) we have to subtract about £20 million corporation and excess profits duties. For rates we must also deduct a sum which may perhaps be put at from £20 to £30 million. On the other hand, I should have expected to find an addition corresponding to the £50 million added in 1907 for persons working on their own account and very small firms.

A small item (£16 million) for waste products used again is included in 1924, but not in 1907. In the total this perhaps may be cancelled against £15 million deducted for depreciation of consumers' goods in 1907 but not in 1924. Neither of these items would appear in the alternative account of income.

The question of the right allowance for depreciation is very difficult. Mr. Flux's "provisional estimate" is £300 million, which amounts to $11\frac{1}{2}$ per cent. of the value of goods before the charges for transport and distribution are considered. This depends on a consideration of "the capital goods included in the income total," and therefore appears to relate to the amount of depreciation made good in the year, and not necessarily to the amount that occurred. In 1907, £175 million was allowed, being as much as 17 per cent. on the value of goods, and at this percentage we should have to allow £450 million, i.e. an additional £150 million, in 1924. For income we ought to aim at the complete restoration of capital, though for Mr. Flux's purpose of estimating the value of goods coming into consumption his method is no doubt valid. How depreciation is allowed for in the Income Tax assessments, which in fact determines its treatment in the alternative reckoning, is a question which I hope Sir Josiah Stamp will answer. But there seems to be an *a priori* case for reducing Mr. Flux's estimate of income, perhaps by £150 million. The whole cost of transport and dealing—goods from ports to manufacturers, and from manufacturers to ports or to consumers—is estimated to amount to £1,128 million \pm £220 million. All this should be included on the same terms as net output in individual (or collective) incomes, among the value of services rendered in the year. It is to be

remarked, however, that this sum forms a larger proportion of the value of the goods handled in 1924 than in 1907; for though the *percentage* added to goods passing through retailers' as well as merchants' hands is reduced from the one-half to two-thirds of the 1907 census, to 40 to 60 per cent. in 1924, yet the *proportion* of such goods to all goods is considerably greater at the latter date. This result is unexpected. If the same relation of the expense of handling to the value at the place of production of all goods had obtained in 1924 as in 1907, £70 million less would have been estimated. This is, of course, well within the margin allowed.

The items excess of imports over exports (£338 million) and increase of capital held abroad (£45 million) correspond, of course, to the earnings of ships, commissions, and net interest and other payments due from abroad, all of which are included in the alternative reckoning. The annual values of buildings and the payments for personal and professional services are properly included in both reckonings; but Mr. Flux makes an important exception, in excluding services "rendered by persons in the employ of the central or local government." I do not know on what ground this omission is made. Why does he exclude his own salary, but include mine, which (so far as I can trace its source) comes mainly from taxes and rates? This question is bound up with the whole treatment of rates, taxes, customs and excise. Some £15 million of rates and taxes are included in the net output, and at a later stage £227 million is added for customs and excise. Both these sums are rightly included in the value of goods when they reach the consumer, but they are not the income of any of the producers or distributors, and are not included in the alternative reckoning. Does Mr. Flux mentally transfer these to the services of central and local government officials, while the rest of rates and taxes are cancelled against interest on debt and pensions, redistribution of income not corresponding to current services, which he names in his final paragraph? I cannot think that this is the case, since the sums do not necessarily balance. This would suggest that if I spend 1s. on tobacco, I am spending *ad.* on tobacco and 10d. on Civil servants. If, on the other hand, we include these rates and taxes and add at the end the value of government services, we should include in the national income a sum created by fiat of government, which could be increased *ad lib.* by the transference from direct and indirect taxation. In the alternative reckoning we definitely do not include rates, customs and excise, nor (subject to Sir Josiah Stamp's correction) corporation and excess profits duty. We have therefore £270 million to subtract from Mr. Flux's total, and a large sum to add for the income of government servants, including the Defence Services, to obtain the alternative total. I have no ready means of estimating this sum, but it cannot, I think, be as great as £350 million, nor less than £300 million. I take £250 million provisionally. This is intended to include the Army and Navy, Civil List, Civil Service, salaries, and Local Government clerks' and teachers' salaries, other than those accounted for in Net Output.

Now the sums in doubt are sufficient to reduce Mr. Flux's middle estimate (£3,975 million) to below ours (£3,800). Subtract rates and taxes (£270 million), additional depreciation (£150 million), additional distribution (£70 million), viz. £490 million in all; add public servants' income, £260 million; we then reach £3,735 million. The other items I have named are of minor importance; an addition of £70 million for the output of small employers and independent workers would make the two estimates equal.

The two estimates, measuring not quite the same thing, are perfectly consistent with each other; but both call for much closer analysis than "I have the brains or you have the time" to give to them during the present discussion.

I do not propose to follow the President's discussion on the price movements and the changes in real income in the aggregate or per head; but I should wish to develop his paragraph relating to the price factor appropriate to net output. One of the most important problems which the Census of Production may help us to solve is whether industry is becoming more or less efficient, and I have made some tentative calculations which bear on this question, due to a considerable extent to Mr. Connor, who has kindly placed them at my disposal for another purpose.

Following the President's line of argument, we are concerned with the price changes of materials and of finished goods, and with the proportion that the aggregate value of materials bears to finished goods in 1924. Given these numbers we can compute how much of the increase in the aggregate value of finished goods is due to price, and hence how much is due to quantity, on certain rough hypotheses as to the meaning to be attached to "quantity" in this connection. The detailed working is too intricate for oral explanation, but the figures used are given in a current publication of the *London and Cambridge Economic Service* (Special Memorandum No. 28, "A New Index-number of Wages").

The method is to take reasonable estimates of the rise in price of materials and of finished products respectively between 1907 and 1924, and so to compute the values that the 1924 aggregates of products and materials would have had at the earlier prices. The difference between these results may be taken as the value of the net output, or the work done on the materials, would have had at 1907 prices. In this calculation only the rates of the materials to the net output is involved, not the actual amounts.

If we write m , g and w for the reciprocals of the price changes of materials, gross output, and net output, and R for the ratio of the value of the materials to the net output, it is easily shown that

$$w = g - R(m - g).$$

The ratio of the 1924 value of the net output to the value thus computed gives what we may consider to be the average change of price of a unit of net output. Since the increase of price of the

finished goods has risen more than the price of materials, it is easy to show that the price of the net output has risen yet more rapidly.

Various hypotheses as to the ratio of materials to output, and as to the change in prices of materials and of finished goods, lead to measurements of the increased price of the net output ranging from + 108 to + 123 per cent. Mr. Connor gives + 111.

Now the value of the net output in 1924 was, according to the summary of Preliminary Reports of the Census of 1924, 138 per cent. greater than that in 1907. Since the value in 1924 must equal the value in 1907 when increased in accordance with the change in prices and in accordance with the change of output, we can compute also the change in output irrespective of prices. This ranges from + 7 to + 15 per cent.: Mr. Connor's work leads to + 13 per cent. ($2.38 = 2.11 \times 1.13$ approx.).

We have thus approximate answers to two very important questions:—viz. what was the increase in the cost of production (including profits) per unit between 1907 and 1924, and what was the change in output irrespective of price. Though the calculation is very rough, and probably could be improved by closer study, it is worth while to follow out the relations between the changes thus indicated and certain other statistics.

The index of physical production from 1907 to 1924 thus reached is approximately 113 (100 in 1907). The rough and tentative index of the *London and Cambridge Economic Service*, which prior to the new Census has necessarily neglected the effects of all changes in organization and technique, is only 97½. The index published in the *Economist* indicates a fall of 2 per cent. from 1913 to 1924, and would lead to about 105 for 1924 with 1911 as the base. Sir Josiah Stamp and I (*National Income in 1924*, p. 55) considered on the evidence available that production in 1924 was nearly on the same level as in 1911, and it appears that 1911 differed little from 1907. Even the *Economist* estimates would need a rise of cost per unit of 127 per cent. to yield the increase 138 per cent. found in Net Output. There is then good reason to hold that output has increased more rapidly than the former reckonings, based mainly on use of raw materials, indicated, and that insufficient allowance was made for the development of organization and invention, especially in the war period.

If we take 113 as the index, we find that output *per head* of persons occupied was very nearly the same in 1924 as in 1907, since the whole number returned as employed (salaries and wage-earners) in the two Censuses increased about 1.4 per cent. Per wage-earner alone the output increased slightly, unless we take the index of production as low as 110. The tentative conclusion is that as much *per head* was produced in the shorter working-week of 1924 as in the longer week of 1907. During the seventeen years, whether by better equipment and organization or by better work, or both, about six hours per week has been transferred from work to leisure.

Finally, let us consider the implications of a rise in seventeen years of 111 per cent. in the selling value of unit production. A careful comparison of the average earnings shown by the wage-

return of 1906 and 1924, together with supplementary information, has led me to the conclusion that average earnings * per head per week of all employed workpeople rose about 109 per cent. in this period; and nearly the same figure would be obtained if the survey were limited to industries covered by the Census of Production. This is, within the considerable limits of error involved, the same as the increase deduced above for the selling value per unit output. Since it has already appeared that weekly output per head is nearly the same, the whole group of statistics gives consistent results, unless it can be shown that the proportion of wages to profits, etc. has changed significantly.

It is more usual to think in terms of 1913 or 1914 as a basis for prices and wages. If we assume that output per head did not change significantly between 1907 and the beginning of the war, we find that average earnings per week increased between 1914 and 1924 95 per cent., per hour 110 to 120 per cent., for the same output, while the cost of living has fallen, while wages have been almost stationary. While, I think, everyone is glad that a reduction of hours has been possible, and appears to be justified by the absence of reduction in output, it is impossible to be satisfied that the increase in real earnings is not premature in view of the magnitude of unemployment.

It will, I hope, be understood that in making these points in a limited time, it has been necessary to give the statistics an appearance of greater accuracy than that to which they are entitled. They are non-committal and subject to revision, if any closer analysis is possible or fresh data become available.

SIR JOSIAH STAMP: Under pressure of leaving for another business meeting I think I shall be under no temptation to exceed the limits laid down for the discussion. I want to deal with another aspect of the situation than that already referred to to-night. It is quite true to say that the income method depends upon an aggregation of incomes, but it is only a very loose way of expressing the truth, which is really much stronger. It is not so much that total of incomes as an aggregation of trading accounts and profit and loss accounts after they have been sifted through the machinery of chartered accountancy and the technical staff of the Inland Revenue, examining those accounts and reducing them to a common form and reviewing the results. Adding the income particulars derived from independent returns, those two together form a large part of the total income estimate, and are put on a much firmer basis than an aggregation of individual returns could ever be, because such an aggregation almost invariably errs by deficiency. If that is so, if the national total depends upon a trading account, it is as well to look at a trading account and see what happens there that does not happen in the Census of Production returns. I referred previously to the question of stock. I am going to deal with four points, and the first is that of stock.

* = Time and piece-rates increased less than average earnings.

One of the most important features in a trading account is the taking of stock, because on the one side of the account you have a record of what is sold during the year, on the other side a record of the costs of manufacture, not of those sold goods, but of goods made, and you have to perform the operation of bringing into account the cost of manufacture of unsold manufactures—the excess or deficiency of stock at the end of the year over the beginning. The real reason for this is to eliminate the cost of manufacturing a thing that has not been sold. The ordinary account does not want to count any profit from goods unsold. If the stock bought in at the beginning is the same as that at the end, the problem is simple. There is no difference between the Census of Production and Trading methods if the conditions remain the same; it is only in times of violent change that this may lead to difference.

There are three ways in which stock-taking methods would give a different result to the trading account from that of the Census of Production return. Take the case of a business starting from scratch, with no stock at the beginning of the year, with goods that cost £15,000 to manufacture, and having sold only £10,000. From the Trading Account point of view it is only the sales of the £10,000, and the profit thereon, that counts, whereas under the Census of Production method, it is a question of production whether sold or unsold. The method of the Census of Production of taking gross output at sale price, means that the unrealized profits on goods that have been made are taken into account. The second thing is, that if there is a quantity of goods at the end of the year in *excess* of that at the beginning—if valued at cost—there is under the Accountancy method an endeavour to eliminate the cost of that excess from the expenses, whereas under the Census of Production method the cost of the unsold goods and the profit thereon are reckoned in net value that is brought in. Therefore there is an important difference. There is the net production, which is a different idea altogether from the Income method of reckoning only on realized profits.

A more important difference arises when there is a price change, because although the Census of Production purports to bring in at sales price, very rarely is that sales value written down drastically to net cost to provide a future reserve to meet losses, as is often done in a Trading account. In a time when the prices of particular goods are falling, what is done by the Accountancy method is to take off something more than the cost of manufacture; really a secret reserve against the losses of the future is made, and a highly precautionary method is adopted. In these three ways—by not taking into account unrealized profits; by dealing with difference in quantity and with difference in price—in a time of rapid movement a result is brought out which is rather different from that of the Census of Production returns.

You have to look very narrowly at anything within the year that is in the nature of a calculation and not in the nature of a fact—such as bad debts. If they are much the same at the end of the year as at the beginning, there will be little difference between the two methods,

but if there is change and if you begin to write off bad debts more rigorously, you do something that is not really provided for in any adequate sense in the Census return, and, as Professor Bowley says, you have a different object in making up an income return. If you consider that at the end of the year you make large provisions for all debts, it is not an exact or constant thing. It is quite possible that in bad times or slump it might easily amount to fifty or one hundred millions of a special precautionary reserve.

Another important factor is the difference between depreciation and renewal. In the long run they might amount to the same, but they are spread in very different ways. If dealt with by the way of replacements, there may be very heavy figures at one time as compared with another, whereas the depreciation method places the results much more evenly. If you are taking a census of income in a year shortly after machinery has been put in, repairs and replacements will be small and amount to little. By the Inland Revenue method of allowing say 10 or 5 per cent. of the cost on a diminishing value method, you get a very large allowance in the early history of plant, and small allowance at the end. There would be extraordinary differences between Accountancy methods and actual facts of renewal at a time of great increase or renewals of plant.

Now to consider what may happen where the two methods part. There are in the charges against gross value or in the estimate of provisions for services all the remuneration that is given, say, to bankers. The bank clerks all get their income out of the Census of Production in commodities of all sorts. In the Income Tax return it comes in separately in money. The money that comes out from the concerns that pay it is not necessarily the same as the money that comes in when dealing with the returns of finance houses themselves. There are many concerns that can make reductions of profits on capital account; if there is a heavy depreciation in securities it is a capital matter, and they are able to take account against revenue for the difference between the price of those securities. That comes off the profits. The plus in the national aggregate for the bank receipts is less than the increases for the business payment of interest. Therefore when joining these two things together it is necessary to look to see not only the things that happen in a manufacturing account, but also the things happening in a non-manufacturing account, because when the two things are put together they do not come out to the same total and in the same manner as in the Census of Production. Every kind of precautionary reserve that is allowable for Income Tax purposes is something which, when it is aggregated, is a difference in the Census method and the Accountancy method.

These things matter very little in times that are very smooth, but from 1922-26 quite a number of these factors operated, and it is possible when one comes to examine these points of principle—particularly the movement in stocks and movement in prices—that differences may be found that, on balance, would account for something like £100-150 millions. If, therefore, the Income method gives

a lower result in the mean figure (while well within the extreme of £100-150 millions) it would not be surprising. Most of these things are things that work in one direction, and not in the other. They nearly all work in as precautionary reserves for accountancy, but a corresponding thing does not happen in the opposite direction when a boom is coming.

It is almost certain that if there are differences due to this principle they will register against the Income method, in the sense that it is almost certain to fall below the Census of Production, allowing for the estimates being otherwise on identical lines.

SIR BASIL BLACKETT, on being invited by the Chairman to speak, regretted that it was not within his capacity to join in the debate. He had arrived late, and had enjoyed himself much too much to spoil the evening by taking part in the discussion.

DR. W. H. COATES said that in the first place he would like to stress the observation made by Sir Josiah Stamp in regard to the very great difference between the Income method and the Census of Production method. There was a great difference between the machinery set at work for the two processes. Under the Income Tax method the trader presented what he considered to be the results of his trading, and in the great majority of cases he made it up from his accounts. To that extent the method was similar to the Census of Production method. In each case there was a form to start with; in each case the form was filled up; but when the Inland Revenue people received the form they said, "Let us see about this," and they started making investigations and comparisons. Often they sent to the taxpayer long and sometimes irritating questions. "What about this?" "What does this mean?" "Give us an analysis of this item." The taxpayer handed the questions to his accountant, who prepared the answers, and the Inland Revenue Inspector then said, "Will you please call?" A long interview might then take place and perhaps more information would be required. Each side, of course, knew the broad principles upon which it was working, and at last they reached a result satisfactory to them both.

Dr. Coates said that, with great respect, he suggested that nothing like that process took place in regard to the Census of Production. Income Tax came once a year. The Census of Production came once in seventeen years. (The Board of Trade did not finish the Census of 1912.) He would not like to suggest that the manufacturer did not pay great regard to the instructions for making the return, but there was no permanent machinery installed throughout the whole country for the purpose of arguing out with the manufacturer the precise way in which he reconciled his return with his audited accounts or of settling matters with him on the same lines as those adopted for Income Tax. That in itself made a great deal of difference to the comparative accuracy of the respective results emerging

from these two methods (the Income Tax method and the Census of Production method) of estimating the national income.

When he took Mr. Flux's figures, totalling up to £3,980 million, and then looked at the figures which were known—taken from the imports and exports, the agricultural figures and Census of Production—he found that these ascertained sums totalled £2,240 million, leaving £1,740 million which consisted of estimates. In other words, the result consisted of 57 per cent. fact and 43 per cent. estimate. On that account alone he thought that the Census of Production method could be accepted only within very broad limits. The difficulties involved in making these estimates appeared to him to be stupendous; in fact, without analysis of the most intricate and detailed description and without full co-operation from the trading world these estimates must lie within very large margins of error.

For instance, there was the business of separating up professional services of all description between the earning side, with which Mr. Flux in his net output figures was mainly concerned, and the spending side. This division related to all those payments to the professional classes, doctors, dentists, lawyers, etc., also to payments for the services of transport by railways and roads, telephones, houses and so on, including many classes of agents. The figure put in, including the value of houses, was £650 million. It would be appreciated how difficult it was to deal with these figures and to get them without very much more information on to a substantially accurate basis.

In the case of rents, Mr. Flux estimated an increase of 50 per cent. above the amount taken before the war. Did that take into account the income from the subletting of houses? Everybody knew that in the overcrowded conditions of to-day the subletting value had far exceeded the 40 per cent. increase permitted by the Rent Restriction Acts.

Taking the question of income arising from personal services included in the estimates, there was an enormous increase in that mode of expenditure. He thought that the 40 per cent. addition taken for that figure was quite insufficient. It was difficult to know by what means the spending part, *i.e.* payments for private journeys, was separated from the earning part, *i.e.* payments for business journeys on the railways. It would seem to be an extraordinarily difficult task. When one looked to the professions, banking, housing insurance and amusement and personal services, Dr. Coates thought that on such figures as were available to him, the estimate of £650 million might well be deficient by anything from £150 to £200 million.

The method of the Census of Production was a kind of dual method; it estimated the value of the goods as they finally came into consumption by taking the value at the factory gate and adding an estimate of the services rendered from that point to the stage of consumption; it also had to deal with the income arising from the exchange between goods and services and between services and services. It was quite possible that by one man undertaking to dig his neighbour's garden for a shilling an hour, in return for the same

service to his own garden rendered by his neighbour for the same price, the income would go up. Every time a service was exchanged for money there was an addition to the national income. Only the Income method would take accurate account of these exchanges.

The next point was the allowance for depreciation. In the original Census of 1907 there was an estimate of £1,500 million for industrial capital (fixed and floating), of which £1,000 million was earmarked for buildings, plant and machinery. They had not been favoured with a similar estimate for this year, but if it were taken at 50 per cent. increase on that figure, *i.e.* a total to-day of £1,500 million, £300 million would represent a 20 per cent. provision. He knew that the £300 million included renewals and repairs because of the formation of the net output figure, but even when that was taken into account, consulting such figures as were available to him, he could not help feeling that that figure was substantially on the high side.

Another point that required explanation was where the particular item of services rendered in regard to exports was dealt with. At the point at which a total of £2,655 million was reached by Mr. Flux the exports of £201 million were deducted less 12½ per cent., which represented the services for getting them out of the country. That was £90 million, but that figure did not seem to be included in the total income, unless it was in the £650 million estimate for services. If so, that would make the latter figure even more difficult of acceptance.

MR. MACROSTY said that he did not intend to occupy many minutes, but he felt bound to answer Dr. Coates on one point. Mr. Coates had ventured on a comparison between the methods of the Inland Revenue and of the Census of Production Office, to the detriment of the latter. He suggested that the Census returns did not receive the same scrutiny as Income Tax returns received at the Inland Revenue. Mr. Macrosty could assure Dr. Coates that no Census return was passed for tabulation until it had been examined by several officers and until the Department was satisfied, frequently after prolonged correspondence, that the return was correct. It should be remembered that the persons filling up the Census returns obtained no advantage from filling them up wrongly. The anxiety of the persons concerned to present correct returns might be gauged by the fact that large numbers of them came to, or wrote to, the Census Office to obtain guidance in filling up their returns—guidance which was always readily given. It was quite certain that the Census returns when finally passed were as complete and accurate as any Income Tax returns.

Dr. Coates said that the Census of Production came once in seventeen years: the facts were that the first Census took place in 1907, the second Census took place in 1912, and, although owing to the war that Census was not fully completed, it was complete as regarded important sections and a good deal of use was made of it

in the Report on the 1921 Census. The long gap between the second and the third Census was due to the war, and the fourth Census would probably be taken at a more normal interval.

Finally, when Dr. Coates animadverted on what he called "the incompleteness of the Census of Production," he forgot one subject which was unpleasant to Inland Revenue officials past and present, namely, evasion. Mr. Macrosty did not think that anyone would agree with Dr. Coates in believing that the Inland Revenue Department managed to discover the whole of the taxable income of the country.

MR. NORMAN CRUMP said he felt a little loth to intervene in the discussion, partly because he felt that he was in the midst of a battle of giants, partly because, like Sir Basil Blackett, he had come to the meeting to be interested and instructed, with no thought of joining in the discussion, and partly because he must plead guilty to a certain sense of confusion, and to make such a plea in respect to a paper read by the President was more a confession of his own weakness than anything else.

His first difficulty was to know what exactly was meant by the national income of the country? Was it regarded in terms of goods or in terms of money? He had been looking at Mr. Flux's table, and the impression it left on his mind was that it was not so much a tabulation of national income as a tabulation of national expenditure, and that here was the sum-total of goods and services available to spend money upon. If by national income, money income was meant, then Mr. Flux's calculations did not quite give the idea they should. Mr. Crump said he wished to make it perfectly clear that he was not by any means convinced that national income should be thought of in terms of money, but it was necessary to be clear in one's mind as to what exactly was meant. He thought Professor Bowley and Sir Josiah Stamp would agree with him that whatever conception they had in mind, the method used in their investigations was based on money income, because they worked on the basis of wages and salaries. The impression left by the President was that he was concerned more with goods and the total output of the country. Mr. Crump agreed that up to a certain point they were taking two different roads to a given goal, but there was one important question of principle—the question which Professor Bowley had already raised: What was the proper place in which to put the revenue of the National and Local Government authorities on the one hand, and what was the proper place in which to put the services they rendered to the public? Mr. Crump found a little difficulty in getting over the inclusion in the table of Customs and Excise duties alone, and not other revenue. He did not propose to enter into the vexed question as to whether or not other items of taxation should find a place in the table, but he felt a certain lack of balance, and thought that all taxation should be either in or out.

On the other side, when he saw the item "Services," whether it included services rendered by the President or Professor Bowley,

he had an uneasy feeling that Government revenue expenditure was really being counted twice over: once when Customs duties were collected, and secondly when they were applied to the remuneration of public servants for the work they did for the country. He could not help feeling that this was really part and parcel with his deeper sense of confusion of the money income and what there was to spend, as arrived at by Professor Bowley and Sir Josiah Stamp, and the goods income, which was the method of approach adopted by the President. He agreed that much of his sense of confusion arose from his own lack of appreciation of this question, but he ventured to remind the Society that these figures of national income had been bandied about from pillar to post in the past, often by people who did not understand them at all, and he felt that in any conclusions brought forward in the future it should be made clear not only how the results were arrived at, but exactly what they meant, so that the uninitiated could understand them.

MR. L. R. CONNOR said that the Society took a traditional interest in problems connected with the national income, and he felt he was voicing the opinions of all present when he said that these traditions had been worthily upheld by three members who ranked as leading authorities on the subject.

Since the war the difficulties of the problem had been magnified by perplexities incidental to price changes and the increasing burden of social expenditure; these had been magnificently attacked by Professor Bowley, Sir Josiah Stamp and Mr. Flux, and the Society should congratulate itself upon the opportunity afforded for the discussion of the problem of national income in the light of their researches, and of bringing their opinions on the subject to a focus. The main issue was that Professor Bowley and Sir Josiah Stamp, working by the Incomes method, had arrived at a net total of £3,800 million for the year 1924, whereas Mr. Flux, working by the Census of Production method, had arrived at a figure of £4,000 million. The difference of 5 per cent. between the two estimates might not be considered significant in ordinary circumstances, but, as it happened, it was sufficient to influence a decision on the question whether the national income per head in 1924, judged by statistical criteria, was on the up-grade or on the down-grade in comparison with the year 1907. Most people would not wish to challenge the substantial accuracy of the two estimates given within the limitations of their respective methods, and it remained to be seen whether these differences could be ascribed to any systematic cause, or whether they were merely the result of those fluctuations with which statisticians were familiar. The national income of a particular year could not be considered in isolation; whatever calculations were made must always be undertaken with respect to the years that went before and after, and Professor Gini put the matter very well when he said that a moving national income could not be measured for the same reasons that a moving object could not be weighed. It was possible that the linkages between the year 1924 and other years might be

different under the Incomes method and under the Census of Production method.

If the two estimates were put side by side it would be seen that, generally speaking, they involved the same economic content. The net output under the Census of Production method represented a fund from which salaries, wages, rates, taxes, etc. were paid. The only exception to this identity of economic content occurred with respect to rates on business premises. The Census of Production method included those rates, whereas by the Incomes method they did not figure in the aggregate. The amount involved might be something in the neighbourhood of £30 million a year, and thus the difference between the estimates might be reduced to £170 million.

In considering the question of depreciation, for which Mr. Flux had allowed an amount of £300 million, Mr. Connor said that, if he remembered rightly, this estimate was based upon, or at least had reference to, a somewhat similar calculation made for the year 1907, which represented a percentage upon the estimated amount of capital employed in industry in the shape of buildings, machinery, etc. With great diffidence he wished to suggest that this estimate of £300 million was not quite sufficient. The total capital wealth of this country could hardly be less than £20,000 million, of which a substantial proportion was represented by buildings, machinery and other things liable to deterioration, and he felt that an estimate somewhat larger than the one given by Mr. Flux would be appropriate. Of course one was faced with the difficulty that the total amount included in the Census of Production in respect of constructional work and work that could be supposed to represent replacements of capital only amounted to £500 million, and if any larger estimate than the amount given by Mr. Flux were accepted there would be a difficulty in reconciling that estimate with the estimated amount of the national savings which had been given on high authority. One might perhaps get over the difficulty by suggesting that during the war the capital equipment of the country had depreciated very substantially, and that therefore the amount of depreciation that had to be written off in 1924 was something less than normal. It might also be put from the following point of view; that it was very difficult to draw a distinction between new capital goods, and goods which merely replaced capital goods, between replacements that did not represent any addition to capital values, and replacements that involved an addition to earning power. Possibly it might be held that Mr. Flux's estimate—if one took an optimistic view of the amount of depreciation—might be held to provide for some anticipation of future profits.

With regard to Professor Bowley's contention that there was no provision in the Census of Production estimate for the salaries of Civil servants and Local Government officers, Mr. Connor pointed out that the net output of industry as defined by Mr. Flux contained, among other things, provision for payment of taxes, and he inferred that it contained provision for all payments to Civil servants whatso-

ever, and that no special estimate was necessary as regarded the activities of Government Departments.

He understood that Mr. Flux was going to speak later, and suggested he should give some information as to what had been done in the Census of Production calculations on the question of repairs conducted by the maintenance staff of the firms concerned, and repairs given out to other firms.

MR. C. O. GEORGE felt that he must start with an apology for speaking at all; he was probably one of the persons least qualified to do so, and his only reason was the question of Customs and Excise duties which had been raised by several speakers. Customs and Excise revenues appeared to be the "Cinderella" of the story. They had been largely disregarded in studying the question at issue, and as he had spent some time studying them, he thought he might make a few remarks on the subject. It was necessary to remember that Customs duties were not always charged on goods as they came into the country, but often in the warehouse, or even after manufacture—as in the case of tobacco—and it seemed possible that some of the figures might be affected in this way. Tobacco might go into the factory duty-free, and customs be charged when it came out of the factory. On the other hand, there was the possibility of duplication. All Customs and Excise duties were not duties on commodities. Mr. George did not know whether allowance had been made for Entertainments duty, which accounted for several millions. There was also the question of Licence duties, which were usually regarded as direct revenue; he agreed so far with Mr. Crump, suggesting that in this case the taxation of licence-holders might be placed in the same category as their income tax, and he would be glad to hear from Mr. Flux whether that was included.

The explanation of these points lay in the difference between Mr. Flux's net figure of £227 million and the official figures of £234½ million for 1924-25 and £268 million for 1923-24. This was a matter on which he would like enlightenment, and he hoped that Mr. Flux would have time to give some further information on these questions.

MR. PERCY WALLIS said he would like to make one suggestion. He had been trying to move the Chambers of Commerce to get the Census of Production taken so that it would compare with the returns of incomes made for Income Tax purposes. The Census of Production should be taken so as to show the actual income of the seven millions of persons which are included in the return. In this form it would be more useful from a business point of view, and the result could be directly compared with the Income Tax returns. If we had the actual amount paid out each year in wages, salaries and dividends we should know the net income of the people employed in industry. The present Census shows an indefinite sum of money which cannot be compared with any other return, and cannot be used to estimate the national income.

THE PRESIDENT said that the only doubt he had in his own mind was whether it was more in accordance with the traditions of the Society that he was not to consider the Presidential Address as under discussion, and therefore that he was under no obligation to make any remarks, or whether it was his obvious duty and privilege to join in the general discussion of this interesting question of the amount of and the methods of estimating the national income. He would try as briefly as possible to say something on the latter head, and would begin by saying how cordially he agreed with Dr. Bowley when he began by expressing his view, that the most remarkable thing about these two very diverse methods of obtaining an estimate of the same thing was that they should agree as closely as they did agree. That was a most remarkable thing and, as he had stated in his Presidential Address, he thought the utility of proceeding by different methods was not to be found in the depreciation by any worker of methods other than those he himself used, but rather in that an opportunity was afforded of finding out what further criticism should be applied to each particular method, so that each might be improved. He felt sure that Dr. Bowley was absolutely at one with him on that point, and he would like to stress the note with which Dr. Bowley began—that of the remarkable agreement between the results of different estimates. Certain speakers had devoted their attention to pointing out that there were some rather big differences; that probably various sums escaped record by the Income Tax method, and on the other hand that various portions of the estimate he had had the honour of laying before the Society were too small. Dr. Coates thought that, in the matter of services, an addition of £150 million to £200 million should be made to the total of £3,975 million named in the tabular statement on p. 163, while Dr. Bowley and Sir Josiah Stamp pointed to different items which they thought might properly require a deduction of £100 million to £150 million from the total. So far as the final aggregate is concerned, these suggested amendments go far to balance one another. Dr. Coates' arithmetical calculations as to the proportion between ascertained and estimated elements he found it difficult to accept. If totals that included some element of estimation were to be classed as wholly estimates, the Income Tax totals would not escape. Conventional allowances by way of deduction cannot be accepted as ascertained figures of the elements for which the deductions are intended to provide. The contrast between the two methods in respect of the percentage of estimate in the totals is really much less than Dr. Coates represents, and the very fact that the Second Census results have not been available for publication bears witness to the mistake involved in supposing that errors and omissions escape detection and challenge, since it is the incompleteness of this process which constitutes the difficulty in the way of publication. This consideration alone is sufficient to justify to the full the remarks of Mr. Macrosty.

On another point, a good deal had been said about Customs and Excise duties. The procedure to which he invited the Society was to

measure the income of the nation in goods and services. So far as it referred to goods, they had to be expressed in money and taken at the point at which they became income. They had then borne all the taxes which came upon them, Customs and Excise taxes in particular. It happened that the business methods of different industries engaged in making taxed products were not alike, and in some cases the deduction of materials from gross output would leave a net output in which Excise and Custom duties would be included, and in others they would not be. It was desirable to get them all on to the same footing, and the best way was to exclude the taxes in the few cases in which they were included. Therefore, having taken the figures of production exclusive of duties, one added in the whole of the amount of the Customs and Excise taxation of goods. This is not the aggregate Customs and Excise revenue, since clearly the Entertainments Tax must be excluded, and some other smaller items not representing taxation of goods.

Mr. Flux suggested that the very principles to which he was giving expression involved the procedure that was followed, and left other Government revenues to meet the large mass of Government services for which it paid. Time would not allow him to enter on the discussion of how far, if at all, there might be duplication in that procedure.

He wished to add a word about depreciation. Those who had read the Report on the First Census of Production would know that the amount allocated for depreciation there was clearly stated as, not the amount used for that purpose in the year, but the amount estimated to be chargeable in respect of depreciation in that year. They had tried to get the same idea carried on to 1924, and he had ventured to emphasize in his Address that there was another side to the question, viz. that a good deal of the maintenance of plant involved the making good of depreciation. In some industries at least in which the maintenance was very costly this was carried out by the staff of the enterprises themselves, and the material they bought from elsewhere was included in their total of materials. In the net output there was a charge for wages of people engaged in adapting those materials for the purposes of maintenance and replacement of plant. A very large part of the cost in some cases fell under that head. It was impossible to estimate how much of the actual expenditure on purchased material was devoted to maintenance of the plant; it was known that some was, and Mr. Flux had suggested that it was very probable that in a case like the year 1907, when the pressure for delivery of goods was rather strong, there was not as much devoted to this purpose as in 1924, when most plant had plenty of producing capacity to spare and an opportunity for bringing the plant up to standard condition. He might, perhaps, add at this point that Dr. Coates' assumption that industrial equipment only was covered by the depreciation estimate involved an oversight. Mr. Connor, rightly taking the broader view, found the estimate insufficient, perhaps failing to keep in mind that £300 million was not the whole of the provision made.

In passing, he would like to say one word on a point raised by Dr. Bowley, viz. charges for distribution. In that case he had done his best to classify on the same basis as for 1907 the goods in respect of their involving greater, smaller or no charges for distribution, and if they were differently distributed, that would be expressed in the figures. In addition, he had the advantage of some expert advice as to what was a reasonable amount to cover the charges of distribution. Without that advice the figure put down for distribution would have been between £160 and £200 million greater than it was.

Sir Josiah Stamp had suggested that the Census of Production mode of procedure might count profit before goods were sold. All he could say was that it should not do so. Goods unsold should be valued on the soundest and most conservative bases among those presented in the very vivid description given by Mr. Coates and Sir Josiah Stamp of procedure in business accountancy, and the instructions given with the forms required that where goods were not sold they should be valued on the basis of their cost. He did not recognize the justice of the suggestion that the valuation for Census of Production purposes was different from that for Income Tax purposes. It was possible that the question of bad debts might raise a different question regarding the allowance to be made, but he would not like offhand to give even a rough estimate of the magnitude of that allowance.

He would refer only to one other small point made by Dr. Bowley. The calculation in the First Census Report provided, as fully as that made in his Address, for the waste products of consumption utilized as materials for subsequent production. There was, thus, no failure of comparability on this head. What allowance for those who escaped the Census of Production net might be proper for 1924 it had not yet been possible to estimate. It was believed that the later survey was more complete than the earlier one. In any case, any such allowance would add to the final estimate of national income, and could not, therefore, assist in reconciling it with another and smaller estimate.

As a result of the ballot taken during the meeting the candidates named below were unanimously elected Fellows of the Society:

Sidney Ernest Reay Beattie.

Charles Courtney Cramp.

John Edward Holloway, B.A., D.Sc.

Harry Alexander Lindsay, C.I.E., C.B.E.

George A. Mitchell.

James Fowler Tocher, D.Sc.

G. Ronald White, B.A.

Barnet Abraham Zaiman, I.C.S.

AN INVESTIGATION OF SICKNESS IN VARIOUS INDUSTRIAL
OCCUPATIONS.

By A. BRADFORD HILL, Ph.D., of the National Institute for
Medical Research.

[Read before the Royal Statistical Society, February 19, 1929, the President,
Mr. A. W. FLUX, C.B., in the Chair.]

Introduction.

It must be admitted that, in this country, our knowledge of the incidence of sickness amongst the population insured since the introduction of the National Health Insurance Acts is still relatively slight. The only authoritative and at all detailed evidence on the subject is that which was submitted by the Departmental Actuarial Committee to the Royal Commission on National Health Insurance appointed in 1921,* and that contained in the very valuable paper read before this Society by Sir Alfred Watson in 1927.† The former—the so-called Selected Societies' Experience—relates to the years 1921-23 and provides considerable data relating to the number of claimants in those years and the weeks of sickness and disablement suffered (besides dealing with numerous points of actuarial and financial importance). The Selected Societies were so chosen as to represent as nearly as may be a microcosm of the whole insured population.

Sir Alfred Watson has further utilized the information secured by this Committee (of which he was Chairman) to show (amongst many other points) the average rates of sickness and disablement suffered at different ages amongst men and women, dividing the latter into single and married, both in amount of incapacity, number of claims and length of claims. He has given in addition information concerning the yearly movements of the incidence of sickness, its seasonal fluctuation, and the improvement in relative healthfulness as evinced by a comparison of the experience of 1921-23 with that of the old friendly societies at the close of the nineteenth century. For men the fact emerges "that among societies constituting a large and a thoroughly representative sample of insured men only about two claims for sickness benefit arose in the years 1921-23 for every three that would have been made if the friendly society experience of the later years of the nineteenth century had repeated itself."‡ The

* Appendices to the Report of the Royal Commission on National Health Insurance. Cmd. 2596. 1926.

† *National Health Insurance: a Statistical Review*, Vol. XC., Part III. 1927.

‡ *Ibid.*, p. 450.

factors responsible for this decline cannot be determined; they may be economic—changes in the standard of living; they may be medical—the advancements in the practice of medicine and surgery; while general hygienic improvements and education in matters of health must have contributed their quota. What causes of illness have declined most materially and what changes in incidence are to be found? The reply to these questions would, I think, assist us in interpreting this fall in the sickness rates, and enable us to realize the relative importance of the various causes of disease amongst the insured population at the present time. On such questions the material quoted gives no assistance. These data relate only to sickness as a whole. Some information as to causes may be obtained from the more recent annual reports of the Chief Medical Officer of the Ministry of Health. The procedure has been to make a special scrutiny of a sample of the insurance medical records relating to a particular year and to ascertain the causes of sickness which led insured persons to consult their insurance doctors. For instance, for 1924 the results set out in Table I were reached.* One-fifth of the claims, it is seen, originate from the cause group containing the common bronchial ailments, while large contributions to the total are made by influenza, diseases of the digestive system, rheumatic diseases, and accidents.

TABLE I.

A Sample of the Insured Males in Representative Areas, Urban and Rural. Proportion of Certain Diseases to Total Cases. 1921. (Based upon 72,272 claims.)

Disease.	Claims per 1000 of Total.
1. Influenza	137.7
2. Tuberculosis, all forms	10.0
3. Organic Heart Disease	11.0
4. Anæmia	1.9
5. Bronchitis, Bronchial and Nasal Catarrh, Cold, etc.	201.1
6. Pneumonia and other Diseases of the Respiratory System	19.5
7. Diseases of Digestive System	115.9
8. Diseases of Genito-urinary System	15.7
9. Diseases of Nervous System and Special Senses	42.9
10. Skin Diseases	33.3
11. Injuries and Accidents	131.8
12. Abscess, Boils and other Septic Conditions	79.3
13. Lumbago, Rheumatism, etc.	103.0
14. Debility, Neuralgia and Headache	36.1
15. Malignant Disease	2.1
16. Other Diseases	51.8
	<hr/> 1000.0

* Figures extracted from Annual Report of the Chief Medical Officer of the Ministry of Health for the Year 1924.

These figures form some supplement to the much more detailed analysis of all causes of illness in the Selected Societies' Experience of 1921-23, but they do not help in certain very material points. They relate only to *claims*—they do not tell us the amount of time that is lost by each cause of incapacity; they relate to persons of all ages and do not discriminate between the contributions made at various periods of life. The Chief Medical Officer has calculated that in 1924 approximately 23½ million weeks' work was lost in England and Wales through sickness amongst the insured population. Yet we are nearly totally ignorant of the relative importance of the various ailments that contribute to this enormous economic and social loss. I have been recently, and am still, engaged upon some investigations of sickness in certain industrial occupations, and it seemed possible that the data secured in these enquiries might be so utilized as to make some very small contribution towards filling these gaps in our knowledge. Being confined to specific occupations it is obvious that the results cannot be applied to the general insured population. But a study of the general population on an adequate scale is only possible by a repetition of the analysis of the Selected Societies' Experience, cause of sickness being an additional factor studied.

In these special enquiries I have met difficulties which are likely to arise frequently in dealing with National Health Insurance statistics. Some consideration of these difficulties here may be of assistance in future investigations.

The three industries with which I have been concerned are Cotton Weaving,* Printing,† and Cotton Spinning.‡

The first enquiry was confined to one year—mid-1925 to mid-1926; the second and third extend over five years, the printing enquiry from 1921-25, the spinning enquiry from 1923-27. In dealing with the incidence of the various causes of disease I propose to use mainly the data relating to printers. In the weaving enquiry the numbers were not large enough for detailed consideration of causes of illness, while for the spinners I am not yet in a position to present such figures.

The printers are nearly all males, and the female experience obtained in this enquiry was too small to be of any value.

* Industrial Fatigue Research Board. Report No. 48. Artificial Humidification in the Cotton-weaving Industry. Its effect upon the Sickness Rates of Weaving Operatives.

† Industrial Fatigue Research Board. Report No. 54. An investigation into the Sickness Experience of Printers, with special reference to the incidence of Tuberculosis (shortly to be published).

‡ Investigation still in progress.

PART I.

THE CAUSES OF INVALIDITY.

I. *In a Male Population (Printers).*

Fifteen main cause groups were adopted. These were as follows :—

- | | |
|---|--|
| 1. <i>Influenza</i> | Influenza, post-influenzal debility, influenzal cold. |
| 2. <i>Phthisis</i> | Phthisis, hæmoptysis, tuberculosis. |
| 3. <i>Rheumatism</i> | Rheumatism, sciatica, lumbago, perichondritis, myositis, synovitis, bursitis, arthritis, fibrositis, myalgia, torticollis. |
| 4. <i>Diseases of the Respiratory System</i> | Bronchitis, pneumonia, asthma, pleurisy, cold, pleurodynia, coryza, catarrh, emphysema, congestion of the lungs. |
| 5. <i>Diseases of the Nasopharyngeal and Upper Digestive Tract.</i> | Tonsillitis, sore throat, laryngitis, ulcerated throat, quinsy, pharyngitis, polypus, rhinitis, trachitis, antrum, septic throat. |
| 6. <i>Diseases of the Circulatory System</i> | Anæmia, chlorosis, angina pectoris, arterial sclerosis, aneurysm, dropsy, mitral disease, phlebitis, varicose veins, tachycardia, purpura, morbis cordis, piles, hæmorrhoids, ulcerated leg, endocarditis, pericarditis, myxœdema. |
| 7. <i>Diseases of the Digestive System</i> | Constipation, diarrhœa, dysentery, hernia, dyspepsia, indigestion, gastritis, gastric catarrh, gastric ulcer, colitis, gallstones, colic, peritonitis, appendicitis, enteritis. |
| 8. <i>Diseases of the Nervous System.</i> | Thrombosis, embolism, insanity, neurasthenia, hysteria, neuritis, epilepsy, neuralgia, nervous debility, vertigo, myelitis, insomnia, chorea, faints, paralysis, tuberc, cerebral hæmorrhage. |
| 9. <i>Diseases of the Skin.</i> | Erythema, erysipelas, dermatitis, impetigo, urticaria, herpes zoster, abscess, adenitis, cellulitis, pyæmia, glands, boils, furunculosis, septic sore. |
| 10. <i>Diseases of the Urinary System.</i> | Nephritis, Bright's disease, renal stricture, cystitis, calculus, hæmaturia, albuminuria. |
| 11. <i>Diseases of the Reproductive System.</i> | Orchitis, menorrhagia, epididymitis, dysmenorrhœa, salpingitis, endometritis, mastitis, climacteria, hydrocele. |
| 12. <i>Other Causes.</i> | Cancer, diabetes, debility, asthenia, otitis media, mastoid disease, conjunctivitis, glaucoma, myopia, ophthalmia, chicken pox, measles, scarlet fever, mumps, parotitis, diphtheria, pyrexia, chill, malaria, febricula, migraine, rheumatic fever, acute rheumatism, cyst, carbuncle, fistula, osteitis, necrosis, jaundice, dental trouble. |
| 13. <i>Accidents.</i> | Accidents, burns, sprains.* |
| 14. <i>Gout.</i> | Gout, podagra. |
| 15. <i>Not stated.</i> | |

* As far as possible cases of workmen's compensation were excluded from the experience.

Where two causes were given or a change in diagnosis was made during the period of incapacity (all the medical certificates were examined for periods of incapacity of duration greater than three months) the sickness has been grouped under the major cause (some guidance was obtained from the Manual of the International List of Causes of Death as used for the classification of deaths in England and Wales) or under the cause which was probably responsible for the main part of the time lost through the sickness. No difficulty was experienced in thus grouping the very great majority of the sicknesses, but in a small percentage some arbitrary rule had to be followed. For example, such a diagnosis may have appeared as "influenza and rheumatism," and it is not possible to assign the sickness to Group I rather than to Group III or vice versa.

It is important to realize the necessarily unsatisfactory basis of any sickness classification. Whatever system is adopted must needs suffer from serious imperfections. For instance, in the grouping here adopted there are very obvious objections to the group entitled diseases of the Nervous System (Group 8), and the imperfection is perhaps maximal here. Under this heading have been included utterly disparate diagnoses. Here have been placed the directly circulatory disturbances of thrombosis and embolism because, in practice, the diagnoses mostly relate to disturbances of the cerebral circulation. Here are also states due to "organic" changes of the central or peripheral nervous structures, such as myelitis, tabes and neuritis, and troubles belonging to the field of the psyche without any known organic correlate and described by vague words such as debility, neurasthenia and hysteria. The work of Dr. Culpin and Miss May Smith suggests that of the total volume of industrial sickness a substantial proportion should be assigned to the so-called psycho-neurotic group. But if, as in my investigations, one is concerned with the statistical analysis of certified sickness, it is impossible to make a differentiation. I am dealing, and I am compelled to deal, not with the scientific causes of sickness but with the certified causes.

Turning to the results, in Table II are given the rates for each of the cause groups, both for sickness (first 26 weeks of incapacity) and for disablement (incapacity after first 26 weeks of incapacity), and in Table III these rates are expressed as percentages of the rates for all causes so that a clear picture may be given of the relative importance of each cause of incapacity at each age. In Table IV the average number of days per claim is given for each cause of sickness.

The total number of men included in this investigation was a few short of 33,000 and the number of person-years of exposure to

risk over the five years' period in each age group is shown in Table II. The totals at all ages are 136,493 years of exposure to sickness and 131,591 years of exposure to disablement.

The number of periods of incapacity classed as *influenza* is very striking. From age 16 to age 49 approximately one quarter of the illnesses are classified under this heading. The amount of time lost by it does not form so great a proportion, since such claims (as is shown in Table IV) are relatively short. Yet from ages 16 to 49 it accounts for approximately 16 per cent. of the total amount of time contributed by all illnesses. After age 50 it bears less heavily in number of claims, though the duration of the average claim is lengthened—as would be expected in the later years of life. This heavier case incidence in the younger age group is in accordance with the relatively heavier mortality at such ages, a shifting having taken place from the older age groups to the younger in the pandemic of 1918, a phenomenon which still exists in a modified form. In long-period illness this cause is of no importance for its sequelæ fall into other cause groups.

In *phthisis*, naturally the reverse is seen. Short sicknesses form a relatively slight percentage of the whole—especially in the number of claims made. To the disablement experience of ages 16 to 49 it is the greatest contributor. At these ages it supplies between 30 and 40 per cent. of the time lost by chronic incapacity and between 30 and 40 per cent. of all claims made. Whether this is true of the general insured population is very dubious. The problem which led to this investigation of sickness amongst printers was the abnormal incidence of *phthisis* amongst them—as judged by their mortality rates. Although from *all causes* of death they have definitely *lower* rates than all males, from *phthisis* they have very definitely *higher* rates. Their incapacity rates from this cause are therefore very probably distinctly in excess of those suffered by the whole insured population, and we cannot assume that this relative prominence amongst printers is general. Though *phthisis* must undoubtedly play a very considerable part in the disablement suffered by the total population, it will not make such a very large contribution to the whole as is here in evidence. Another feature which is not seen in the general population and is in evidence amongst printers is the high rates at ages 16-19 followed by a fall in the next age group. The Selected Societies' Experience shows a steady rise throughout life. Other industries may share in this peculiarity of the printers, but the insured classes as a whole do not. This singularity should be remembered in any discussion of the age distribution shown here for the various diseases.

Rheumatism, ignoring this first age group, shows a steady rise

with age, and in the final group, 60-69, accounts for 12 to 13 per cent. of all short- and long-period incapacity. In disablement it is not of very appreciable importance until this final age group is reached, but in sickness it contributes a fairly constant and substantial proportion after age 30. Certain Approved Societies have expressed their concern at the proportionate cost to their funds of this disease, and it may be of some interest, therefore, to have shown thus for this sample the numerical importance of the cause.

Ailments relating to the *respiratory system* form a group of considerable prominence throughout life. Again the rates rise steadily with age (leaving out of account the peculiar first age group), and, at ages 60-69, for every 29 sickness claims made, 7 have their origin in this group; and for every 11 disablement claims, 2.3 have their origin here. This is the result largely of the accumulation of chronic bronchitics and asthmatics. In sickness this group of illnesses never contributes throughout insured life less than 10 per cent. of the total time lost or of the total claims made. In disablement its relative importance is slighter before age 50. Table IV shows that the time lost per claim coincides with the average for all illnesses. In conjunction with influenza this group—including the common cold and the bronchial complaints—must be held to be one of those mainly responsible for the great loss of working time through relatively minor ailments, individually trivial but so imposing in the aggregate.

Diseases of the *naso-pharyngeal tract* show a radically different incidence—a rate steadily falling with age, tonsillitis being the commonest component of the group. In disablement they have no place. In sickness their importance is not very great except in the first age group when they produce about a ninth of all the claims made. This, again, may be true of only this class of worker.

Diseases of the *circulatory system* are of rare occurrence in early life, but their incidence rising steadily they become prominent as a cause of both short- and long-period incapacity by age 50. In sickness they give rise to claims of duration over 50 per cent. above the average for all diseases (Table IV), and their importance lies somewhat more in the length of sickness that they involve than in the number of claims they produce. In disablement their duration is not far removed from the average (these figures are not very helpful as they show the average duration of claims *within the calendar year*, and claims may last over several years), but after age 30 they begin to contribute a significant quota, and from ages 60-69 they are responsible for a fifth of all chronic ailments.

Diseases of the *digestive system* are of main import in short-period sickness. The rates rise slightly throughout life, but in

relation to all diseases they exhibit a nearly constant proportion at each age. It may be said that, roughly, they give rise to 10 per cent. of the short claims made under the Acts and are responsible for about the same proportion of the time lost, the duration per claim conforming to the average duration for all diseases. In disablement they play a less part and average only about 5 per cent. of the rates from all causes.

Diseases of the *nervous system* reveal a steady rise with age, and occupy the position of highest importance amongst chronic illnesses. In sickness they provide long periods—their average duration being 50·6 days against the general average of 29·2 for all causes—but until age 60 they are not responsible for more than 5 per cent. of the claims made. At ages 60–69 they supply 9 per cent. of the claims made. In duration, on the other hand, they provide nearly 10 per cent. from age 30 to age 59 and 13 per cent. in the final age group. Their importance, therefore, lies in their production of a relatively few serious illnesses of considerable length. In disablement this is still true—the duration is more prominent than the number of claims—but both rates are extremely prominent. Between ages 16 and 59 they contribute approximately one-third of the time lost and one-quarter of the claims made, and Table IV shows that, even within the calendar year, the duration per claim, 264 days, is considerably in excess of the average for all causes, 202 days.

Diseases of the *skin* show rates with very little fluctuation throughout life—the high rate at ages 16–19 may again be a peculiarity of this experience. If not, these are the years of age with the highest incidence. To disablement such causes contribute practically nothing. In sickness their percentage contribution falls with age, being as high as a tenth at ages 16–19, but on the average producing round about 5 per cent. of time lost and claims made. In other words, it is not a negligible cause group in producing the sum-total of minor sicknesses. The duration per claim is shorter than the general average, 22·6 days against 29·2.

Diseases of the *urinary system* do not occupy a prominent position amongst these men. The rates rise throughout life (the rates for disablement at ages 16–19 are quite unreliable, being based on but two claims) and are only of any magnitude in the final age group, 60–69. Even in this group they produce only 3 to 4 per cent. of the rates from all causes. The sickness claims that are made are of long duration, 44 days, or 50 per cent. above the average; the disablement claims, on the other hand, are short (they are few in number and the figure may not be reliable), being nearly one-third below the general average.

Diseases of the *reproductive system* are entirely negligible for men

and need no attention. The fact that such certified sickness is practically absent does not, of course, justify any inferences as to the real incidence of venereal diseases for this industrial population.

The group entitled "*other causes*" shows a higher incidence in later life—if the first age group be ignored. In sickness the proportion of time lost and claims made that it contributes to the total is very constant throughout the age groups and approximates to 10 per cent. In disablement it is of less moment until age 40 is reached, after which age the rates become appreciable and contribute between 10 and 15 per cent. of the total of all sickness. The group is thus one of some importance.

In *accidents* only those accidents and injuries not included under the provisions of the Workmen's Compensation Act are dealt with. Such casualties provide quite a distinct proportion of all morbidity, their incidence being lowest in mid-life and highest at each extreme of insured life. To long-period incapacity their contribution is negligible, but in sickness they are responsible for 5 or 6 per cent. of the total amount of time lost and of the claims made.

Gout was kept separate in this investigation for a particular purpose (occupational incidence), but is of no importance here. The *unrecorded* causes are few in number and form a quite inconsiderable proportion of the total.

Summarizing these data briefly, the conclusions from this sample are as follows :—

1. Ignoring the first age group, which shows rates possibly peculiar to the printing industry, diseases classed under the headings of rheumatism, and of the respiratory, circulatory, digestive, nervous and urinary systems, together with those classed as "*other causes*," all show a definite rise with age. Diseases of the naso-pharyngeal tract form the only cause group that shows a constant decline with advancing age. Phthisis shows no very definite movement, but the phthisis incidence is undoubtedly peculiar in this sample; influenza claims fall in number after age 40, but their duration increases; diseases of the skin and accidents give U-shaped curves with their maxima at the extremes of insured life and their minima in mid-insured life.

2. In short-period sickness (first 26 weeks of incapacity) influenza is the predominant cause, supplying a quarter of all the claims between ages 16 and 50, and approximately one-sixth of all the time lost through short periods of incapacity. Next in importance are the diseases of the respiratory system, which produce between 10 and 15 per cent. of all short-period sickness between ages 16 and 50, and approximately 20 per cent. of all short-period sickness after age 50. Other causes of short sicknesses that are of import-

TABLE II.
Sickness Rates (for 26 weeks) and Disablement Rates (after 26 weeks) for all *P. minteri*, 1921-25, by Cause Groups

Age Group (Average birth day at 11 1)	Per cent years of Exposure to Risk	INFECTIONAL (1)			PNEUMONIA (2)			RHEUMATISM (3)			RESPIRATORY SYSTEM (4)			
		Day rate *	Claim rate *	No of claims	Day rate	Claim rate	No of claims	Day rate	Claim rate	No of claims	Day rate	Claim rate	No of claims	
Sickness														
16-19	8648 0	0 91	0 47	478	0 40	0 43	87	0 20	0 00	78	0 45	2 25	197	
20-29	19228 0	0 35	4 03	787	0 36	0 43	84	0 17	0 83	162	0 44	1 63	819	
30-39	35775 0	0 65	4 84	1482	0 35	0 43	166	0 16	1 25	423	0 46	1 56	827	
40-49	52541 0	0 62	3 70	1806	0 41	0 41	174	0 48	1 02	608	0 46	2 14	912	
50-59	27848 0	0 64	3 45	969	0 29	0 38	109	0 49	2 21	468	0 52	4 14	1153	
60-69	11402 0	0 77	3 32	379	0 13	0 16	15	1 44	3 74	420	2 05	6 89	786	
Disablement														
16-19	4529 0	—	—	1	0 87	0 35	17	—	—	—	—	—	1	
20-29	19316 0	0 01	0 02	4	0 77	0 40	78	—	—	—	0 08	0 05	16	
30-39	33419 0	—	—	9	0 86	0 42	111	0 01	0 02	6	0 14	0 10	8	
40-49	59011 0	0 01	0 03	9	1 00	0 40	176	0 31	0 10	85	0 16	0 18	63	
50-59	27678 0	0 02	0 04	11	0 65	0 31	46	0 44	0 14	40	0 60	0 40	189	
60-69	11836 0	0 06	0 13	14	1 12	0 43	40	3 14	1 20	140	4 64	2 30	261	
Sickness														
16-19	8648 0	0 31	2 31	200	0 15	0 22	49	0 44	1 03	137	0 31	0 71	61	
20-29	19228 0	0 16	1 21	237	0 10	0 44	86	0 43	1 34	301	0 25	0 64	125	
30-39	33775 0	0 14	0 65	821	0 20	0 32	175	0 32	1 48	600	0 32	0 77	260	
40-49	52541 0	0 09	0 33	188	0 29	0 78	274	0 62	2 77	624	0 44	0 92	824	
50-59	27848 0	0 07	0 33	91	0 74	1 66	461	0 97	2 08	280	0 61	1 12	811	
60-69	11402 0	0 10	0 23	26	1 57	2 97	330	0 78	2 25	256	1 60	2 46	250	
Disablement														
16-19	4529 0	0 01	0 02	1	0 02	0 06	3	0 04	0 04	2	0 32	0 13	6	
20-29	19316 0	—	—	2	0 02	0 03	3	—	0 06	12	0 62	0 24	46	
30-39	33419 0	—	—	1	0 16	0 09	30	0 07	0 07	23	0 82	0 32	106	
40-49	59011 5	—	—	3	0 32	0 13	47	0 14	0 14	46	1 07	0 43	182	
50-59	27678 0	—	—	2	0 33	0 33	92	0 14	0 13	86	2 36	0 84	234	
60-69	11336 0	0 04	0 03	3	4 04	2 08	236	0 97	0 44	50	6 31	2 45	281	

* The day-rate is day-of-sickness (or disablement) per year of exposure. The claim rate is number of claims made per 100 per year of exposure in each case. No rate is shown unless both are more than 0 01.

TABLE II (continued).

Age Group (Age, last birthday at 11.21.)	Pay-on years or Exposure to Risk	SKIN (9)			URINARY SYSTEM (10)			REPRODUCTIVE SYSTEM (11)			OTHER CAUSES (12)			
		Day rate	Claim rate	No of claims	Day rate	Claim rate	No of claims	Day rate	Claim rate	No of claims	Day rate	Claim rate	No of claims	
Sickness														
16-19	8048 0	0 35	2 16	187	0 06	0 15	13	0 02	0 08	7	0 60	2 64	228	
20-29	19325 0	0 22	1 18	231	0 03	0 13	26	0 01	0 09	17	0 32	1 37	268	
30-39	33775 0	0 19	0 84	319	0 07	0 22	73	0 01	0 06	20	0 32	1 27	429	
40-49	31291 5	0 23	0 96	350	0 12	0 20	103	0 02	0 05	18	0 44	1 96	481	
50-59	27848 0	0 29	1 10	306	0 17	0 36	100	0 02	0 06	18	0 71	1 77	492	
60-69	11402 5	0 37	1 11	126	0 45	0 78	89	0 02	0 04	5	1 23	2 22	253	
Disablement														
16-19	4829 0	—	—	—	0 12	0 04	2	—	—	—	0 04	0 08	4	
20-29	19316 5	0 08	0 04	7	0 01	0 01	2	—	—	—	0 04	0 01	8	
30-39	83419 5	0 03	0 01	5	0 01	0 02	8	—	—	—	0 06	0 07	22	
40-49	35011 5	—	—	5	0 02	0 03	9	—	—	—	0 45	0 20	71	
50-59	27675 5	0 05	0 09	24	0 10	0 08	23	—	—	—	0 97	0 43	118	
60-69	11336 0	0 07	0 06	7	0 71	0 43	40	—	—	—	2 19	0 05	108	
ALL CAUSES														
UNRECOLATED (1a)														
GOT T (14)														
ACCIDENTS (13)														
Sickness														
16-19	8048 0	0 97	1 97	170	—	—	1	0 01	0 03	3	4 08	21 24	1897	
20-29	19325 0	0 94	1 13	221	0 01	—	1	0 05	0 11	22	3 58	14 75	2847	
30-39	33775 0	0 21	0 79	267	0 07	0 07	2	0 05	0 13	44	3 74	15 19	5131	
40-49	31291 5	0 29	0 95	337	0 07	0 43	152	0 04	0 12	44	4 81	16 92	5970	
50-59	27848 0	0 39	1 10	382	0 19	1 09	304	0 03	0 08	22	6 60	21 34	5942	
60-69	11402 5	0 46	1 37	156	0 27	1 00	114	0 09	0 10	22	12 26	28 72	8275	
Disablement														
16-19	4829 0	—	—	—	—	—	—	—	—	—	0 02	0 77	97	
20-29	19316 5	0 05	0 06	11	—	—	—	0 06	—	—	1 72	0 96	192	
30-39	33419 5	0 05	0 04	14	—	—	—	—	0 02	7	2 30	1 22	407	
40-49	31011 5	0 09	0 05	17	0 01	0 07	20	—	—	2	3 48	1 54	644	
50-59	27675 5	0 09	0 07	16	0 29	0 13	17	0 02	0 01	4	5 86	3 06	848	
60-69	11336 0	0 09	0 12	14	0 29	0 13	17	0 13	0 06	7	24 58	10 90	1212	

TABLE III.
Sickness Rates (first 26 weeks) and Disablement Rates (after 26 weeks) for All Printers, 1921-25, by Cause Groups,
the Rates for each Cause being expressed as Percentages of the corresponding Rates for all Causes.*

Age Group. (Age last birthday at 1.1.21.)	INFLUENZA. (1)		PHTHISIS. (2)		RHEUMATISM. (3)		RESPIRATORY SYSTEM. (4)		NASO-PHARYN- GEAL TRACT. (5)		CIRCULATORY SYSTEM. (6)		DIGESTIVE SYSTEM. (7)		NERVOUS SYSTEM. (8)	
	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.
<i>Sickness.</i>																
16-19...	17	26	9	2	6	4	10	11	7	11	3	2	9	7	3	3
20-29...	16	27	10	3	5	6	12	11	5	8	4	3	12	7	4	4
30-39...	18	29	9	3	8	8	12	12	4	6	5	3	11	9	5	5
40-49...	13	22	9	3	10	11	14	13	2	3	6	5	13	10	5	5
50-59...	10	16	4	2	9	12	18	19	1	2	11	8	10	9	5	5
60-69...	6	12	1	1	12	13	22	24	1	1	15	10	6	13	0	0
<i>Disablement.</i>																
16-19...	—	—	40	45	—	—	—	8	1	8	2	8	4	5	17	17
20-29...	—	—	45	40	—	—	5	8	—	—	7	7	2	6	24	24
30-39...	1	2	37	34	—	—	6	10	—	—	7	7	3	8	30	30
40-49...	—	—	29	27	5	5	5	16	—	—	6	7	4	6	31	31
50-59...	—	—	11	10	4	4	12	16	—	—	9	11	2	4	40	40
60-69...	—	—	4	4	13	12	19	21	—	—	20	19	4	4	26	23
Age Group. (Age last birthday at 1.1.21.)	SKIN. (9)		URINARY SYSTEM. (10)		REPRODUCTIVE SYSTEM. (11)	OTHER CAUSES. (12)	ACCIDENTS. (13)		GOUT. (14)		UNRECORDED. (15)					
	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Day rate.	Day rate.	Claim rate.	Day rate.	Claim rate.	Day rate.	Claim rate.				
<i>Sickness.</i>																
16-19...	7	10	1	1	—	15	8	9	—	—	—	—				
20-29...	6	8	1	1	1	9	10	8	—	—	1	1				
30-39...	5	6	2	2	—	8	6	6	—	—	1	1				
40-49...	5	6	2	2	—	9	6	6	1	3	1	1				
50-59...	3	4	3	3	—	11	6	6	2	3	—	—				
60-69...	—	—	4	3	—	10	4	5	—	—	1	1				
<i>Disablement.</i>																
16-19...	—	—	13	5	—	4	—	—	—	—	—	—				
20-29...	—	—	1	1	—	3	6	3	—	—	—	—				
30-39...	1	1	—	—	—	3	3	3	—	—	3	2				
40-49...	—	—	—	—	—	13	11	1	—	—	—	—				
50-59...	1	3	2	3	—	16	14	2	—	—	—	—				
60-69...	—	—	3	3	—	9	9	—	1	1	1	1				

* This table reads: of the 5,472 cases of sickness on 1.1.21, 17 per cent. of the days lost and for 26 per cent. of the claims made; phthisis was responsible for 5 per cent. of the days lost and for 2 per cent. of the claims made; and so on for each age and for each disease.

ance are rheumatism, diseases of the digestive system, "other causes," and accidents and injuries. Diseases of the circulatory system only become of moment after age 50, but sicknesses (in the technical sense of first 26 weeks of illness) arising from such causes and from diseases of the nervous and urinary systems are of considerably longer duration than the general average for all causes.

3. In long-period illness—disablement (incapacity after the first 26 weeks)—the two predominant causes are phthisis and diseases of the nervous system. The former from age 16 to 50 is responsible for at least one-third of all the disablement suffered, but this incidence is probably peculiar to the printing industry and cannot be applied to the general insured population. Diseases grouped under the nervous system throughout insured life contribute at least one-third of the duration of all chronic ailments and one-quarter of all the claims. Other diseases of importance in long-period incapacity are rheumatism (after age 60), diseases of the respiratory and circulatory systems (after age 50), and "other causes" (after age 40).

TABLE IV.

*Average Number of Days lost through each Cause of Sickness.
Data for Printers, 1921-25; all ages.*

Cause Group.	Number of Days per Claim (within the Calendar Year).	
	Sickness.	Disablement.
1. Influenza	16.9	33.9
2. Phthisis	79.0	203.0
3. Rheumatism	26.6	220.3
4. Diseases of the Respiratory System	29.0	164.6
5. Diseases of the Naso-pharyngeal Tract	15.6	53.4
6. Diseases of the Circulatory System	45.6	214.1
7. Diseases of the Digestive System	31.6	136.9
8. Diseases of the Nervous System	50.6	263.9
9. Diseases of the Skin	22.6	105.3
10. Diseases of the Urinary System	43.8	137.2
11. Other Causes	33.6	213.6
12. Accidents	29.1	103.4
All Causes	29.2	202.3

II. In a Female Population (Cotton Weavers).

I have no data relating to women which can be treated in such detail as has been applied to the printers' experience. The enquiry into sickness amongst the operatives in spinning mills will provide, eventually, similar figures, for a large number of women are involved,

but the analysis of this material is not yet complete. The investigation of 1925-26 into sickness in weaving sheds provides certain data for women, but these are not on a sufficiently large scale to enable age incidence of diseases to be discussed.

The figures given (in Tables V and VI), therefore, relate to workers of all ages. It has been seen in the various rates of incapacity given for males how closely morbidity incidence and age are connected. Care must therefore be taken in discussing these figures; they cannot be used for comparisons, except of the very broadest kind, between men and women or between single and married women, since the age distribution in these different populations varies materially.

On the other hand, the age distribution of the female cotton weavers only differs very slightly from that for the selected societies representing the general insured population. The percentage of the total population falling in each age group is as follows :—

Age Group. (Age last birthday.)	Spinners and Widows.		Married Women.	
	Selected Societies.	Cotton Weavers.	Selected Societies.	Cotton Weavers.
16-24	50	54	11	10
25-34	24	24	36	41
35-44	13	12	30	31
45-54	9	7	17	15
55-64	5	3	7	2
Total	101	100	101	99

The weavers represent a slightly younger population. The very distinct difference between the single and married populations is obvious. To this extent weavers are representative of the whole insured population; in two other important respects they differ significantly—they are confined to one industry, and located in one area—Lancashire. For these reasons they cannot form a random sample of the insured class and their sickness cannot be taken as representative.

Table V shows that amongst these single women the most important cause group is that relating to diseases of the digestive system. It accounts for one-fifth of the claims made and of the time lost. This is double the incidence found amongst the male printers and cannot be explained by the difference in age constitution. Yet it is not peculiar to women, for the male weavers show a similar liability, digestive disturbances being their most prominent cause of illness and similarly producing a fifth of all incapacity.

TABLE V.

The Rates of Sickness (first 26 Weeks of Incapacity) amongst Cotton Weavers in Lancashire—Women, Single and Widowed. 1925–26. Crude Rates for all Ages.

Cause Group.	Number of Days of Sickness per Person-year of Exposure.	Number of Claims per 100 Person-years of Exposure.	Each Rate as a Percentage of the Rate for all Causes together.	
			Days.	Claims.
Influenza	1.27	4.83	15	19
Phthisis	0.19	0.21	2	1
Rheumatism	0.78	2.13	9	8
Respiratory System ...	0.96	2.71	11	10
Circulatory System ...	1.10	2.43	13	9
Digestive System ...	1.73	5.77	20	22
Nervous System ...	0.58	1.61	7	6
Skin Diseases	0.50	2.09	6	8
Urinary System	0.10	0.26	1	1
Reproductive System ...	0.28	0.70	3	3
Other Causes	0.71	2.04	8	8
Accidents	0.29	1.06	3	4
Pregnancy	0.04	0.14	1	1
All Causes	8.53	25.98	99	100

Number of person-years of exposure = 7994.

TABLE VI.

The Rates of Sickness (first 26 Weeks of Incapacity) amongst Cotton Weavers in Lancashire—Women, Married. 1925–26. Crude Rates for all Ages.

Cause Group.	Number of Days of Sickness per Person-year of Exposure.	Number of Claims per 100 Person-years of Exposure.	Each Rate as a Percentage of the Rate for all Causes together.	
			Days.	Claims.
Influenza	2.14	7.73	11	15
Phthisis	0.09	0.15	—	—
Rheumatism	2.08	5.34	10	10
Respiratory System ...	2.09	5.80	10	11
Circulatory System ..	2.45	5.68	12	11
Digestive System ...	3.23	9.31	16	18
Nervous System ...	1.21	2.73	6	5
Skin Diseases	0.75	2.15	4	4
Urinary System	0.41	0.90	2	2
Reproductive System ...	1.52	3.14	8	6
Other Causes	1.10	2.88	5	5
Accidents	0.48	1.49	2	3
Pregnancy	2.67	5.43	13	10
All Causes	20.22	52.73	99	100

Number of person-years of exposure = 5895.5.

The difference must be an occupational or geographical one. Influenza occupies the next position amongst these women, also accounting for one-fifth of all claims made, but, since these are relatively short claims, for just under one-seventh of all the time lost. Rheumatism, diseases of the respiratory system, of the circulatory system, and "other causes" all contribute approximately one-tenth of the invalidity suffered. Nervous and skin diseases are also appreciable. Tuberculosis is very slight, as only short-period sickness is being dealt with, and I have no figures for disablement for these populations.

Amongst the married women weavers in Lancashire (Table VI), digestive disorders are again the most prominent. Their relative position is not so high as it is with the single women or with the men, since illness related to pregnancy forms a group of considerable size and thereby lessens the percentage contributions of the other causes. This latter cause of married women's illness supplies a tenth of all claims, although it does not include pregnancies unaccompanied by sickness—the sickness here discussed is that suffered apart from the 4 weeks of confinement.

Influenza, as with single women, comes next in importance after digestive ailments, while rheumatism, diseases of the respiratory system, and of the circulatory system again supply some 10 per cent. of the total invalidity. The great disparity between the rates of single and married women, as shown by Sir Alfred Watson in the Selected Societies' data, is derived, it is seen, from nearly every cause group, phthisis and skin diseases, as regards number of claims, being the only exceptions. Phthisis is a disease that is prominent in disablement, but means little here where short-period sickness alone is under consideration. The higher incidence of skin diseases amongst single women is possibly due to their younger age distribution. The excess of sickness suffered by the married women in every other group is certainly not a reflection of the differences in age distribution. It is clear that the position of inferiority of married women in National Health Insurance (whatever may be its cause), a position which Sir Alfred Watson has defined as "serious in the fullest import of the word," is due not to any special tendency to claims of a few particular types, but to a general tendency to more frequent claims from virtually every form of sickness. Unfortunately the fact that the rates are crude rates for all ages does not allow any closer comparison to be made.

Summarizing, the following conclusions are reached:—

1. In a population of women workers of approximately the same age distribution as the general insured population, but located in one particular occupation and locality (cotton weavers in Lanca-

shire), the most prominent cause of sickness amongst both single and married women is the group entitled diseases of the digestive system, which contributes one-fifth for single women and one-sixth for married women of all incapacity. Influenza comes second in importance, while diseases of the respiratory system, of the circulatory system and rheumatism contribute each about one-tenth of the total illness suffered. Diseases associated with pregnancy are, naturally, an important cause amongst married women. The predominance of digestive ailments is not found amongst printers, though it is found similarly amongst male weavers. This suggests a geographical or occupational peculiarity.

2. Although detailed comparison is not possible (only crude rates at all ages being available), the serious excess of sickness amongst married women over that of single women is clearly derived from virtually every disease group.

III. *The Annual Movements of Sickness and Disablement Rates.*

Before concluding this section dealing with the causes of invalidity it may be of some interest to see whether the annual fluctuations of the incapacity rates can be interpreted in terms of such causes. The figures given by Sir Alfred Watson * show that the cost of sickness benefit for men began in 1913 at a high level, fell off distinctly during the war years, remained fairly constant after the war till 1924 and 1925, in which years a sharp rise took place. Discussing such short-period sickness he says, "from 1920 to 1923 the sickness claims among men varied within fairly narrow limits, and, if the figures as to later years had not suggested the contrary, the experience would seem to have been stabilized, and this at a substantially lower level than that of the pre-war period. While the claims of the years 1924 and 1925 would throw doubt upon a proposition that a stable condition has been reached, the cost of even these years has been far below the 1913-14 figures." † With disablement the expenditure has been continuously increasing since the inception of the scheme. This feature was expected, since the original insured population was a population *at work*, and the accumulation of the chronically disabled is thus a gradual process. Sir Alfred Watson writes, "so far as men are concerned the table shows a definite slackening in the rate of increase since 1922, and it is to be hoped—though experience only can show whether the hope is well founded—that this is indicative of approaching stability in the cost of this benefit." ‡ We know now that it is unlikely that stability has yet been reached, since the experience of 1926 was worse than that of

* *Loc. cit.*, Tables III and IX. † *Loc. cit.*, p. 445. ‡ *Loc. cit.*, p. 455.

1925, and in 1927 a still further rise took place. Analysis by cause will show whether there is a general upward movement or whether for some types of disease stability has been reached.

The printers' data for 1921-25 have again been utilized. The movement over these years is very much the same for these workers as it is for the Selected Societies, as is shown in Table VII. For the printers the rate used was the number of days of sickness per person-year of exposure at all ages. The rate for each year is expressed as a percentage of the rate in 1921. For the Selected Societies the figures used (as given by Sir Alfred Watson) are the estimated expenditure in each year for each shilling a week of benefit paid (*i.e.* the total expenditure divided by the rate of weekly benefit, the latter having varied from year to year).

TABLE VII.

Year.	Selected Societies.		Printers.	
	Estimated Expenditure for each shilling a week of Benefit (in £000's)	Expenditure as Percentage of that in 1921.	Number of Days of Sickness per Person-year of Exposure at all Ages (standardized rates)	Rate as Percentage of that in 1921.
<i>Sickness.</i>				
1921	353	100	4 88	100
1922	392	111 + 11	5 11	105 + 5
1923	358	101 - 10	5 03	103 - 2
1924	408	116 + 15	5 77	118 + 15
1925	415	118 + 2	5 96	122 + 4
<i>Disablement.</i>				
1921	246	100	4 26	100
1922	296	120 + 20	4 76	112 + 12
1923	335	136 + 16	5 23	123 + 11
1924	361	147 + 11	5 64	132 + 9
1925	381	155 + 8	5 90	138 + 6

In sickness the printers do not show from 1921 to 1923 fluctuations of such magnitude as those of the Selected Societies (as is shown by the + and - marginal figures), but, throughout, the direction is the same. Similarly, in disablement their increase is on a lower scale, but the parallelism is close, a falling rate of increase in both

cases. To this extent printers form a representative sample of the whole.

Turning first to the question of age in relation to the annual movements of invalidity rates, the position of the day and claim rates is set out for each year in broad age groups in Table VIII, each rate being expressed as a percentage of the appropriate rate in 1921. Between 1921 and 1923 there is little of moment to comment upon. There was a rise in claims in 1922 but a fall again in 1923. The amount of sickness suffered did not differ at all materially except in the final age group, where there was a 9 per cent. increase over 1921 both in 1922 and 1923. The figures for 1924 and 1925 show distinct movements; the rise in sickness expenditure in these years, it is seen, is derived from persons in every age group, both the number of claims and the total amount of sickness in days having increased. It should be observed, however, that the number of claims has increased in each age group to a greater extent than the days of sickness suffered, this being especially so below age 50. In other words, the increasing sickness expenditure is due not so much to the same number of claimants making longer claims, but to a greater number of claimants making relatively shorter claims.

In disablement all three age groups show the increase revealed in Table VII, and at each age, in similar fashion, the rate of increase is slackening. The final age group, 50-69, seems to be the slowest in reaching stability (if we may ignore the 1924 figure for ages 16-19 as a random fluctuation, the rate being very small absolutely at these ages). At ages 16-29 and 50-69 the increases seem to be rather in length of claim and less in the number of new claims arising, while at ages 30-49 both rates have increased at roughly the same pace, though there is a suggestion of an increase in new claims since 1924.

In dealing with the annual fluctuations of cause of sickness, I have returned to an all-ages grouping. Division into age groups in the calendar years would probably produce random fluctuations from small numbers exposed to risk, and also overwhelm one with too much detail. For the latter reason too I have confined myself to the claim rates. They are set out for each year from each cause in Table IX. I have omitted diseases of the urinary and reproductive systems, gout and unrecorded causes, since all these were seen in Tables II and III to be relatively insignificant groups. For a similar reason I have given no disablement rates for influenza, diseases of the naso-pharyngeal tract, of the skin and accidents.

Inspection of Table IX shows that influenza, as would be expected, plays a considerable part in producing the annual fluctuations. It was relatively low in 1921 and 1923 and high in 1922,

TABLE VIII.

The Number of Days of Sickness and Disablement per Person-year of Exposure and Number of Claims per 100 Person-years of Exposure in each Calendar Year expressed as a Percentage of the similar Rate in 1921. Printers, in three Age Groups.

Age Group.		Year.				
		1921.	1922	1923	1924.	1925.
	<i>Sickness.</i>					
16-29	Number of Days	100	91	97	106	116
	„ of Claims	100	104	103	121	144
30-49	Number of Days	100	106	100	122	120
	„ of Claims	100	116	109	137	143
50-69	Number of Days	100	109	109	121	127
	„ of Claims	100	110	104	123	136
	<i>Disablement.</i>					
16-29	Number of Days	100	113	121	144	123
	„ of Claims	100	100	100	111	111
30-49	Number of Days	100	106	108	108	112
	„ of Claims	100	103	107	110	117
50-69	Number of Days	100	117	132	145	155
	„ of Claims	100	115	128	142	149

1924 and 1925, and the same is true for the rates for all causes. Yet epidemic diseases of this type are not the only factor. Looking further we see that since 1921 there has been an absolutely constant rise in the incidence of rheumatism, in diseases of the respiratory system and of the nervous system, and from accidents and injuries. There has been nearly a constant rise in diseases of the nasopharyngeal tract, of the circulatory system, of the digestive system, of the skin and from "other causes." Phthisis is the only illness showing relative stability, and this is of little interest in dealing with short-period sickness. In other words, this analysis by cause adds considerably to our doubts of stability having been reached in sickness experience. If this particular sample is at all true of the whole insured population, then the rise in sickness incidence in 1924 and 1925 is not due predominantly to the incidence of epidemics of infectious diseases, but to a practically constant rise taking place in claims from every form of incapacity.

Even if we take the influenza rates there is evidence to suggest that the higher rates of 1924 and 1925 are not due entirely to a heavier epidemic visitation, but to an increased tendency to claim. The deaths from influenza in England and Wales in these five years were as follows :—

1921	..	..	..	..	8,995
1922	..	..	..	..	21,498
1923	..	..	..	..	8,461
1924	..	..	..	..	18,986
1925	..	..	..	..	12,721

If the number of deaths in each year be expressed as a percentage of those in 1921, we have the following figures in comparison with the percentages given by the claim rates set out in Table IX.

Year.	Deaths from Influenza in England and Wales as Percentage of the Deaths from this Cause in 1921.	Claim-rates from Influenza in the Printers' Experience as Percentage of the Claim-rate in 1921.
1921	100	100
1922	239	156
1923	94	98
1924	211	163
1925	141	180

If the deaths are a reasonable index of the magnitude of an epidemic, then the claims under the Health Insurance Acts have increased in 1924 and 1925, especially in the latter year, to a greater extent than the size of the epidemic would lead one to expect. The increase in the influenza rates is thus not only due to the presence of epidemics, but also to the general causes, whatever they may be, increasing the number of claims from nearly every source of sickness.

Turning to the disablement experience, the annual figures given in Table IX show that the continual rise in chronic illness over these years is derived mainly from diseases of the respiratory system and circulatory system (*i.e.* cases mainly of chronic bronchitis and heart disease after age 50), and from the group of "other causes" (which contains such illnesses as cancer, diabetes and loss of sight, effective after age 50). Phthisis, rheumatism, diseases of the digestive and of the nervous systems are all on a higher plane than they were in 1921, but there is a suggestion that their level is now stable. The causes of the steady increase are, thus, causes as shown by Tables II and III, mainly affecting the oldest age groups. The only two groups of illness found to be of any magnitude in producing disablement in early life were phthisis and diseases of the nervous system, and in neither of these is the increase since 1923 very definite.

Summarizing:—

1. Judging by the printers' experience the level of short-period sickness is certainly not yet fixed. The increases in 1924 and 1925 were not predominantly due to the severity of epidemics in those

years, but to a general increase in claims for benefit derived from nearly every cause of sickness. The increase is not confined to persons at any particular period of life, but is spread over the whole population.

2. In disablement the slackening rate of increase apparent for the whole population is to be found at each age, but the final age group, 50-69, seems to be the slowest in reaching stability. This is because the largest additions to chronic illness are now being made by diseases of the respiratory and circulatory systems and by causes such as cancer, diabetes and loss of sight, while the two main groups of diseases contributing disablement at the younger ages, phthisis and diseases of the nervous system, show signs of relative stability since 1923 (the phthisis incidence may be peculiar to this experience).

TABLE IX.

Sickness and Disablement Claim Rates by Cause of Incapacity at all ages in each Calendar Year, 1921-25. Printers' Experience. Crude Rates.*

Year.	CAUSE GROUP.									
	Influenza.	Phthisis.	Rheumatism.	Respiratory System.	Naso-pharyngeal Tract.	Circulatory System.	Digestive System.	Nervous System.	Skin.	Other Causes.
<i>Sickness.</i>										
1921	2.84	0.43	1.47	2.60	0.58	0.92	1.52	0.88	1.01	1.45
1922	4.43	0.48	1.65	2.70	0.69	0.84	1.45	0.91	0.99	1.37
1923	2.77	0.43	1.74	2.76	0.69	0.99	1.72	0.99	1.05	1.49
1924	4.62	0.41	1.91	3.13	0.89	1.11	2.00	1.07	1.22	1.70
1925	5.11	0.41	2.25	3.43	1.05	1.19	2.10	1.14	1.30	1.88
<i>Disablement.</i>										
1921	—	0.37	0.15	0.25	—	0.25	0.09	0.56	—	0.18
1922	—	0.41	0.17	0.35	—	0.27	0.11	0.58	—	0.20
1923	—	0.40	0.19	0.38	—	0.28	0.16	0.67	—	0.26
1924	—	0.47	0.18	0.45	—	0.34	0.13	0.66	—	0.31
1925	—	0.43	0.17	0.54	—	0.42	0.16	0.67	—	0.31

Number of claims per 100 person-years of exposure

PART II.

MAIN DIFFICULTIES ARISING IN INVESTIGATIONS INTO SICKNESS
IN INDUSTRIAL OCCUPATIONS.(1) *The Investigation of Sickness amongst Printers.*

The object of this enquiry was to discover, if possible, the origin of the abnormal mortality rates in the printing industry from phthisis. As a preliminary step the sickness experience of the various occupational groups was studied over the years 1921-25. The difficulty was the lack of a standard of comparison. For all causes of invalidity the Selected Societies' experience was available and showed, in short, that printers suffered appreciably less than the general insured population. With their rates from particular causes, *e.g.* phthisis, there were no data to serve as standard, and the only possible method was a comparison of the several occupational groups *inter se*. This method has certain advantages; the figures to be compared are derived roughly from the same economic plane and from persons with the same broad mental outlook, since they all belong to one industry. On the other hand, it has obvious limitations. If all or many of the groups show similar rates from phthisis in one or more age groups, and in the same age groups, we are left with no measure as to whether these rates are abnormal. It may be that *all* occupations in the printing industry show a higher phthisis incidence than is found in occupations of other types. Without a general standard no such conclusion can be reached. It is for this reason—that no such general standard exists—that I have brought together the very imperfect and inadequate figures given in Part I. In thus stressing the lack of a standard of incapacity cause rates I am not unaware of the criticisms that may be, and have been, launched against it. The diagnosis must needs be extremely rough; some wide form of arbitrary grouping must be adopted; and usually only the first diagnosis can be utilized and no changes taken into account (I shall return to this point again later). Yet in spite of these faults I still think that some knowledge of the true incidence of the different causes of sickness experienced by the insured population would be secured, and would be of service both in the evidence that it provided in itself and as a standard of comparison for use in particular enquiries.

Sir Alfred Watson has raised one's hopes of fuller information by stating that he thinks "it advisable, in the public interest, that further investigations should be made at short intervals, on a

sampling basis, of the sickness experience of the Approved Societies." Could not the causes of invalidity have some small part in any such sampling programme?

(2) *The Investigation of Sickness amongst Cotton Weavers in Lancashire.*

In investigating the invalidity in any particular industry there are two methods of approach. The first method takes the Approved Society as its unit. Those Approved Societies which are confined (or virtually confined) to the members employed in the one particular industry are selected. (Such Approved Societies are the successors under the Health Insurance Acts to the old Trade Friendly Societies.) The complete membership, alive and dead, over the chosen period of time is taken, and the sickness experience is related to the occupations recorded on the membership cards. (There will be some error here, since the occupation usually given is that at entry and no change is made in the record if the member changes his occupation. The size of the error obviously depends upon the ebb and flow in and out of an industry or to and fro in its occupational divisions. In a highly skilled trade this would be slight.) The limitation in this method is that the sickness cannot be related to the *place of work*, of which the Approved Societies have normally no knowledge.

The second method takes the workplace as unit. A census is taken of the operatives in the selected factories, mills, etc., note being made of the Approved Societies to which they belong. The sickness history of these persons is then obtained from the appropriate Approved Societies, for a given period of time *subsequent* to the census, the entries and exits from the places of work being taken into account. This enables the sickness to be related to the place of work, but the necessary limitation is that only short-period sickness can be dealt with. The census of operatives within the factories can only refer to persons *at work* at the date of the census—the chronic and semi-chronic invalids are not included. The amount of long-period incapacity, or disablement, that such a population will suffer is limited according to the period of time over which such investigation is continued. In practice it is difficult to extend such investigations over more than one to two years. It is not easy to secure from factories returns of exits and entries over longer periods, while in many trades the labour turnover is too great to enable any further results to be reached by prolonging the period of study.

In the investigation amongst weavers it was imperative to use the second of these methods. Comparison was required of the

incidence of sickness amongst weavers working in mills artificially humidified by the injection of steam or atomized water, and amongst weavers in mills relying on only the natural moisture content of the air. The Trade Approved Societies had no record of the workplaces of their members and so it was necessary to select certain mills, some artificially humidified and some not, and to take a census of their operatives. This was carried out on August 1st, 1925, and the sickness history was obtained from the Approved Societies involved from this date up to July 31st, 1926, *i.e.* a year's experience. The short-period sickness experience only could be studied. The disablement recorded was about 10 per cent. of the sickness, whereas in the Selected Societies it reaches about 80 per cent. It will, perhaps, be of some interest to consider the nature of this loss and its importance to such enquiries. In Table X is shown the relation which disablement bears both in duration and in claims at each age to all incapacity suffered (sickness and disablement). For men and women (both classes) the duration, except in the first age group, forms a very considerable proportion of all incapacity, rising from one-quarter in the case of males to over one-half after age 60. For single women the proportions are still higher. Married women have less than single women in the early age groups. The claims form less considerable percentages, but the figures are still appreciable, especially in the older age groups. Obviously by confining ourselves to short-period sickness we are losing a large amount of the invalidity experienced. Returning to Tables II and III, if the printers' experience may be taken as approximately representative, it is seen that certain causes play no part in disablement and that their true incidence is given by a study of short-period sickness only. Such are influenza, diseases of the naso-pharyngeal tract, diseases of the skin and accidents and injuries (excluding cases under the Workmen's Compensation Act). Before age 40 only two cause groups are of any importance—phthisis and diseases of the nervous system. After age 40, phthisis, rheumatism, diseases of the respiratory system, circulatory system, digestive system, nervous system and "other causes" all make significant contributions to the total.

The conclusion thus is that in being limited to short-period sickness the invalidity experience is at most ages far below its true value, the defect being greater the older the age group; that the defect is derived, according to the printers' experience, from an absence of persons with phthisis and nervous diseases before age 40, and after age 40 from a defect in the incidence of most causes. Only a few causes contribute no disablement. The question that next arises is: supposing we are thus limited to short-period sickness

TABLE X.

Selected Societies' Experience. The Duration of Disablement suffered and the Number of Disablement Claims as Percentages of the Total Incapacity suffered.

Age.	MEN.		SINGLE WOMEN.		MARRIED WOMEN.	
	Weeks of Disablement as per cent. of Total Weeks of Incapacity.	Disablement Claims as per cent. of Total Claims.	Weeks of Disablement as per cent. of Total Weeks of Incapacity.	Disablement Claims as per cent. of Total Claims.	Weeks of Disablement as per cent. of Total Weeks of Incapacity.	Disablement Claims as per cent. of Total Claims.
Under 20	8.8	2.1	10.3	3.1	4.6	3.8
20-24	23.3	5.8	30.9	9.2	14.3	7.8
25-29	29.0	7.6	43.7	14.5	18.6	8.8
30-34	31.1	8.4	47.5	16.6	24.2	9.9
35-39	35.9	9.7	47.5	18.7	29.6	12.8
40-44	38.8	10.9	48.7	19.6	36.0	15.3
45-49	41.6	12.4	49.1	20.7	44.5	19.1
50-54	43.1	13.8	51.9	22.9	50.3	22.7
55-59	51.4	18.9	59.2	25.5	54.8	25.8
60-64	58.7	25.8	65.0	35.5	64.9	35.3

and are using these data for *comparative* purposes, not between cause groups but of incidence amongst two populations, as in the enquiry concerning cotton weavers; will the same conclusions be given from the sickness experience alone as would be drawn from the sickness and disablement experience together? The only method of testing this is by a specific example, and in Table XI are compared the sickness and disablement rates for two of the occupational groups of printers—compositors and machine workers. The rates are given only for those causes in which the amount of disablement is material. In the other groups, short-period sickness, obviously, tell us all that we can hope to know.

Using these rates of sickness and disablement the conclusions are as follows:—

Phthisis. In *sickness* the compositors have the higher incidence in early life, from age 16 to age 29. At ages 30-39 they begin to lose this position of disadvantage, from age 40 to age 59 they have a very definitely lower incidence, but at ages 60-69 again have their higher rates. Although *phthisis* is mainly a long-period disease, this result given by figures only for short-period illness tallies very closely with that given by the disablement figures. In *disablement* the same initial disadvantage of compositors is evident for ages 16-29, at ages 30-39 the rates approximate, at 40-59 the definite inferiority of the machine printers is evident, and at 60-69 the greater incidence amongst compositors is again apparent. Only at ages 30-39 is

there any difference in the conclusions given by sickness and by disablement—in sickness the compositors hold a very slight advantage, in disablement there is no material difference between the two groups.

Rheumatism.—Only the incidence after age 40 need be considered. In *disablement* the machine workers show a distinct inferiority in each age group, from 40 to 69. *Sickness* taken alone gives the same result.

Diseases of the Respiratory System.—In *sickness* there is no difference between the two groups in the first age group; in every other age group the machine printers have the higher incidence, the disparity being least at ages 60–69. The *disablement* experience gives the same reply, with the exception that in the final age group, 60–69, machine printers lose their higher incidence and that compositors are adversely placed.

Diseases of the Circulatory System.—The *disablement* experience is negligible till age 40. After that age the compositors show the higher rates, especially at ages 60–69, the ages of highest incidence. The *sickness* experience alone suggests that there is no difference between the two groups at ages 40–59, while at 60–69 the compositors are, as in disablement, the greater sufferers.

Diseases of the Digestive System.—The disablement rates are relatively low at every age, and the sickness experience is the more important for this cause. In *disablement* the machine printers have higher rates, especially so in the only important age group, 60–69. In *sickness* machine printers are at a more consistent disadvantage after age 30.

Diseases of the Nervous System.—This (in this experience) is an important disablement cause group throughout life. The *disablement* rates place compositors at a considerable disadvantage in the first age group and after age 50. At ages 20–29 they are better off than machine printers, at ages 30–49 only slight differences are observable. The *sickness* rates show the disadvantage of compositors at 16–19 and at 50–59, but not, judging by both rates, at 60–69. From age 20 to age 49 only slight differences exist, though in sickness the differences are favourable to compositors, in disablement they are unfavourable.

Other Causes.—The disablement is only material after age 40. At 40–49 and 60–69 compositors have higher *disablement* rates, at 50–59 somewhat lower. The only difference of moment is in the final age group. In *sickness* the rates show negligible differences at all ages over 40.

I think the general conclusions from this single comparison are that the short-period sickness alone *does* give very nearly the same

answer, as to the *comparative* incidence of causes in two experiences, as would be derived from the total sickness and disablement figures; that of the two major causes of disablement in early and middle insured life, phthisis and diseases of the nervous system, short-period sickness gives a very good representation of the relative incidence of the former, but a less accurate representation of the latter; that it is at ages 60-69, when disablement is at its highest, that sickness alone is least likely to give adequate data for comparative purposes. Naturally one is not justified in generalizing from a single example, but I may add that in investigating invalidity amongst printers I examined the sickness and disablement rates of six occupational groups, and in only one group was there any really material difference in relative position, judging first by sickness and then by disablement. Amongst bookbinders the sickness rates were low, but some of the disablement rates very high. On the other hand, some of these groups were small in number of exposed to risk, and I am of opinion that it is very much safer to judge by short-period sickness alone than to attempt to deal with disablement where small numbers are involved. The "risk" of disablement, especially in younger age groups, is so small in relation to the total exposed to risk, and the duration of those claims that are made is so long, that the addition of but one or two claims, that may easily occur in small samples, makes the rates totally unreliable.

(3) *The Investigation of Sickness amongst Cardroom Operatives in Lancashire.*

The cardroom is part of a cotton spinning mill, and "cading" is one of the preliminary stages in dealing with the raw cotton. The process is the drawing out of the cotton, by machine, into parallel strands and the elimination of dirt and dust that has escaped the earlier cleaning processes. The latter, and more especially the cleaning (stripping and grinding) of the machines, may give rise to a certain amount of dust in the atmosphere of the room. It is maintained by the representatives of the operatives that this exposure to a dusty environment gives rise to ill-health, through complaints of a bronchitic or asthmatic nature. It is the object of the enquiry now proceeding to examine this contention, the invalidity of cardroom workers being compared with that of other workers in spinning mills. The Trade Approved Societies are being taken as unit, the comparison being between operatives recorded as cardroom workers and those recorded as following other specified occupations in spinning mills over a five-year period, 1923-27. (Certain precautions are being taken to check the accuracy of this occupational division.) The difficulty that has been encountered in this investigation relates

to the analysis of the invalidity data according to cause of illness. The Society relating to other workers in the mills has not retained the medical certificates of incapacity, so that the only record of the cause of sickness is that in the sickness registers (or on the sickness record card). This cause is invariably that found on the *first* medical certificate and no change is made if subsequently the diagnosis is changed (except that if the illness is of very long duration, *i.e.* a year, the most recent diagnosis is sometimes put in each new register). In the enquiry concerning weavers each change of diagnosis was obtained for all periods of illness; in the printers' experience each change was obtained in all periods of illness that lasted for more than three months. As already stated, in this enquiry the first diagnosis only can be obtained, at least for a section of the population exposed. The question involved is this then: using broad cause groups (as set out on pp. 208-9), what rates of incapacity in each group will be found if we know all or the majority of the diagnoses for each period of illness, and how much variation will result if we are limited to the first diagnosis only?

Again, for information I have to fall back upon the printers' experience. The rates already given in Table II are those reached by grouping the sicknesses according to the different diagnoses found, account being taken of any change in diagnosis and the period of illness debited to the cause considered to be the major agent. All those cases in which some change of diagnosis occurred have then been taken and the illness grouped according to the *first* diagnosis given—as if no changes had been recorded. Consideration of the proportion of claims that fall into different cause groups when only the first diagnosis is used and when the later changes are taken into account shows that in number they are very small for sicknesses but appreciable for disablement, the figures being shown in Table XII. This would suggest that not a great deal of change is likely to be shown in the rates by confining oneself to the first diagnosis except in disablement in early life. On the other hand, the illnesses in which changes do occur are of long duration and may affect the days of incapacity rate, or the changes may be confined to certain cause groups. To test this the comparative rates are shown in Table XIII—the rates revealed when only the first diagnosis is used and the rates revealed when the later changes are taken into account. In short-period sickness the only cause group in which the change is of any great importance is phthisis. Using only the first diagnosis a good deal of the incidence of this disease is obscured. At ages 16-19 the true rates are nearly halved, and in all the older age groups the loss is still material. Since no cause group shows any proportional increase, it follows that these

TABLE XII.

The Number of Claims (Sickness and Disablement) that fall in different Cause Groups when (1) only the First Diagnosis is used and (2) when the Later Changes in Diagnosis are considered. Printers' Experience.

Age.	Total Claims made.	Number of Claims in which First Diagnosis falls in a different Cause Group from that in which Later Diagnoses fall.	Column (3) as Percentage of Column (2).
(1)	(2)	(3)	(4)
<i>Sickness.</i>			
16-19	1837	18	1.0
20-29	2887	17	0.6
30-39	5131	37	0.7
40-49	5970	42	0.7
50-59	5942	53	0.9
60-69	3275	35	1.1
<i>Disablement.</i>			
16-19	37	10	27
20-29	192	16	8
30-39	407	22	5
40-49	644	40	6
50-59	848	46	5
60-69	1242	74	6

cases of phthisis have been distributed, by using only the first diagnosis, under a variety of headings. At ages 16-19 they have probably been debited to influenza and diseases of the respiratory system, since these causes show the largest increases. Both these cause groups show a slight increase throughout life when only the first diagnosis is used; other causes that show small increases are rheumatism (except at ages 60-69), diseases of the naso-pharyngeal tract, of the digestive system and from unrecorded causes. Diseases of the skin are increased at ages 60-69, but otherwise remain unchanged, and "other causes" and accidents and injuries remain unchanged. Diseases of the nervous system and of the urinary system show a slight fall, and circulatory illnesses are lower at ages 60-69. Except for phthisis very few of the changes are of any great moment.

In the disablement experience the same distinct transference is to be seen in phthisis. It again shows a consistent loss, with its maximum at ages 16-19. The movement has been towards the two groups influenza and diseases of the respiratory system, both of which show substantially increased rates in this first age group. Both also have increased at later ages, the influenza rates being especially magnified at ages 60-69. Most of the remaining differences to be seen are found in this final age group, 60-69, when

TABLE XIII.

*The Sickness and Disablement Rates amongst Printers (1921-26 Experience) compared with the Rates that would have resulted if the grouping by Cause of Sickness had been based upon the First Medical Certificate only.**

Age Group. (Age last birthday at 1.1.21.)	INFLUENZA.	PHARYNGITIS.	RHEUMATISM.	RESPIRATORY.	NASO-PHARYN- GEAL TRACT.	CIRCULATORY.	DIGESTIVE.
<i>Sickness. †</i>							
16-19 ...	0.81	0.40	0.26	0.48	0.31	0.15	0.44
20-29 ...	0.80	0.32	0.26	0.57	0.31	0.18	0.49
30-39 ...	0.58	0.36	0.17	0.44	0.16	0.15	0.43
40-49 ...	0.61	0.32	0.17	0.45	0.17	0.16	0.43
50-59 ...	0.68	0.35	0.30	0.46	0.14	0.19	0.42
60-69 ...	0.70	0.27	0.31	0.51	0.14	0.19	0.44
...	0.62	0.41	0.48	0.65	0.09	0.29	0.62
...	0.67	0.33	0.50	0.69	0.10	0.29	0.62
...	0.68	0.29	0.59	1.22	0.07	0.74	0.67
...	0.73	0.20	0.62	1.31	0.09	0.73	0.66
...	0.77	0.13	1.44	2.68	0.10	1.87	0.78
...	0.81	0.06	1.43	2.79	0.12	1.69	0.85
<i>Disablement.</i>							
16-19 ...	—	0.37	—	—	0.01	0.02	0.04
20-29 ...	0.17	0.10	—	0.15	0.01	0.02	0.07
30-39 ...	0.01	0.77	—	0.08	—	0.02	0.04
40-49 ...	0.01	0.73	0.04	0.10	0.01	0.02	0.06
50-59 ...	—	0.86	0.01	0.14	—	0.16	0.07
60-69 ...	0.92	0.80	0.01	0.18	—	0.09	0.06
...	0.01	1.00	0.10	0.19	—	0.32	0.15
...	0.03	0.91	0.22	0.28	—	0.34	0.14
...	0.02	0.65	0.14	0.69	—	0.55	0.13
...	0.03	0.45	0.34	0.77	0.02	0.56	0.17
...	0.06	1.12	3.14	4.64	0.04	4.94	0.97
...	0.50	0.72	3.37	4.66	0.09	1.76	1.09
...	0.31	0.26	1.38	2.38	0.05	—	0.51

* Actually in this enquiry for periods of illness lasting more than three months all the medical certificates were examined and the sickness grouped under the cause held mainly responsible.

† The rates given are the number of days of incapacity per person-year and the number of claims per 100 person-years, given in that order. The ordinary figures are the rates found using all the diagnoses, the italicized figures are the rates found using only the first diagnosis. The table reads vertically.

TABLE XIII (continued).

Age Group. (Age last birthday at 1.1.21.)	NERVOUS.	SKIN.	URINARY.	OTHER CAUSES.	ACCIDENTS.	UNRECORDED.
<i>Sickness.</i>						
16-19 ...	0.31 0.28 0.25 0.23	0.35 0.35 0.22 0.21	0.06 0.06 0.03 0.02	0.69 0.70 0.32 0.34	0.37 0.37 1.97 0.32	0.01 0.01 0.05 0.06
20-29 ...	0.71 0.68 0.64 0.63	2.16 2.16 1.18 1.17	0.15 0.15 0.13 0.12	2.64 2.65 1.37 1.39	1.97 1.97 1.13 1.12	0.03 0.03 0.11 0.13
30-39 ...	0.32 0.32 0.31 0.31	0.19 0.19 0.95 0.92	0.07 0.07 0.21 0.20	0.32 0.32 1.27 1.36	0.21 0.21 0.79 0.95	0.05 0.05 0.11 0.12
40-49 ...	0.44 0.44 0.41 0.41	0.23 0.23 0.99 0.99	0.12 0.12 0.29 0.29	0.44 0.42 1.34 1.34	0.29 0.29 0.95 0.95	0.04 0.04 0.12 0.12
50-59 ...	0.61 0.56 1.06 1.06	0.29 0.29 1.09 1.09	0.17 0.15 0.33 0.33	0.71 0.68 1.76 1.76	0.39 0.40 1.20 1.20	0.03 0.03 0.08 0.08
60-69 ...	1.60 1.50 2.40 2.40	0.37 0.45 1.11 1.15	0.45 0.42 0.78 0.75	1.23 1.24 2.22 2.23	0.46 0.47 1.37 1.39	0.09 0.12 0.19 0.22
<i>Disablement.</i>						
16-19 ...	0.32 0.32 0.13 0.13	— — — —	0.12 0.12 0.04 0.04	0.04 0.03 0.08 0.10	— — — —	— — — —
20-29 ...	0.63 0.59 0.22 0.22	0.08 0.06 0.03 0.03	0.01 0.01 0.01 0.01	0.04 0.07 0.06 0.06	0.05 0.05 0.06 0.05	— — — —
30-39 ...	0.82 0.80 0.31 0.31	0.03 0.02 0.01 0.01	0.02 0.02 0.02 0.02	0.08 0.11 0.08 0.08	0.05 0.05 0.04 0.04	0.06 0.06 0.02 0.02
40-49 ...	1.07 1.06 0.43 0.43	— — — —	0.02 0.02 0.03 0.03	0.45 0.37 0.17 0.17	0.05 0.05 0.05 0.05	— — — —
50-59 ...	2.36 2.21 0.79 0.79	0.05 0.04 0.08 0.08	0.10 0.10 0.08 0.08	0.97 0.97 0.43 0.43	0.09 0.09 0.07 0.07	0.01 0.01 0.03 0.03
60-69 ...	6.51 6.59 2.42 2.42	0.07 0.08 0.10 0.10	0.74 0.55 0.43 0.31	2.18 2.46 1.05 1.05	0.09 0.12 0.12 0.13	0.06 0.15 0.39 0.15

diseases of the naso-pharyngeal tract, rheumatism, digestive ailments, "other causes" and unrecorded causes all show an increase, diseases of the circulatory and urinary systems show a loss. The diseases of the nervous system show a slight loss at most ages.

This comparison thus shows that by using the first diagnosis only, an erroneous conception of the phthisis incidence is gained, while cause groups of the respiratory disease type are increased by the phthisis cases being added to them. In these data there were 91 phthisis cases in which the *first* diagnosis given was *not* phthisis, and in 58 per cent. the first diagnosis belonged to the group "diseases of the respiratory system," in 9 per cent. to influenza, in 8 per cent. to diseases of the digestive system, in 7 per cent. to "other causes," in 6 per cent. to diseases of the naso-pharyngeal tract, and 12 per cent. are spread over the rest of the cause groups. By using only the first diagnosis there is, too, a general increase at all ages in the two groups influenza and diseases of the respiratory system, while the rates for diseases of the nervous system show a slight fall. In other cause groups the main changes involved are in the final age group, 60-69.

Summary.—The main difficulties inherent in investigations of industrial sickness by means of Approved Societies' records are threefold.

(1) In investigating particular causes of sickness there is no standard of comparison, and an occupational division of the industry studied is the only method of procedure. If all the occupational divisions show a similar incidence, then assessment of the normality or abnormality of the industry is impossible.

(2) In investigating invalidity in relation to environment only short-period sickness can be studied. Approved Societies have no information concerning the workplaces of their members, so that the population at risk in particular factories, etc. has to be obtained by a census in those factories. This census can relate only to persons *at work*, so that the totally or semi-totally incapacitated are excluded, and in a short experience (*i.e.* any experience under, at the least, five years) the disablement incidence is much in defect. A single example taken from the data given in the investigation of sickness amongst printers suggests that short-period sickness alone does give very nearly the same answer as to the *comparative* incidence of causes in two experiences as would be derived from the total sickness and disablement experiences; that throughout insured life the comparative incidence of diseases of the nervous system is the cause least accurately represented by short-period sickness alone, while for all causes it is at ages 60-69, when disablement is at its highest, that sickness alone is least likely to give a true answer.

(3) In investigating cause of sickness it is very laborious and often impossible to secure from Approved Society records more than the first diagnosis. Utilizing again the printers' experience, it was found that the differences in the rates for each cause of incapacity resulting from using (1) only the first diagnosis and (2) all the later changes in diagnosis were as follows: the incidence of phthisis is considerably obscured, the cases being grouped under many other headings, but the majority of them being relegated to influenza and diseases of the respiratory system. Both these cause groups are somewhat heightened throughout insured life, but on the whole for all the causes except phthisis very few changes are of any great moment. In disablement the phthisis incidence is similarly obscured and the influenza and respiratory rates heightened at ages 16-19. The other main difference is to be found at ages 60-69, at which ages many cause groups show materially differing rates when only the first diagnosis is used and when the later are taken into account. Thus in any enquiry in which only the first diagnosis is obtained, considerable caution must be exercised in discussing the phthisis incidence and the incidence of disablement from any cause in the final years of insured life.

PART III.

SOME FURTHER ASPECTS OF NATIONAL HEALTH INSURANCE STATISTICS.

(1) *The duration of claims.*—It was shown in Table IV that the average duration of a claim from short period incapacity arising amongst printers was 29.2 days. (This is the duration of claims within the calendar year, so that it must be somewhat shorter than the true duration.) The value of this mean or average is limited. It gives no information about the distribution of claims according to their length, and it will be of some interest to make an examination of this question. I have made such an analysis for a sample of the printers' experience for sicknesses of duration less than three months. In Table XIV the numbers are set out in fortnightly periods. (These durations are *not* within the calendar year, but represent the actual durations of sickness.) Two age groups have been used, 16-44 and 45-69. In both age groups the distribution is a J-shaped one, or, in other words, sicknesses of very short duration largely predominate. As the duration is extended the number of cases observed falls off very rapidly. In the younger age group over half of the sicknesses under three months do not exceed a fortnight in length and 81 per cent. do not exceed a month. Amongst

the older workers, as one would expect, the numbers of sicknesses in the groups of longer durations are consistently in excess of those for the younger workers—the distribution is definitely less J-shaped. Yet 45 per cent. of their claims (*i.e.* those under three months' duration) do not exceed a fortnight and 73 per cent. do not exceed a month.

TABLE XIV.

Number of Cases of Sickness of Duration 1-14 days, 15-28 days, etc., up to 84 days. Printers' Experience, 1921-25 (sample).

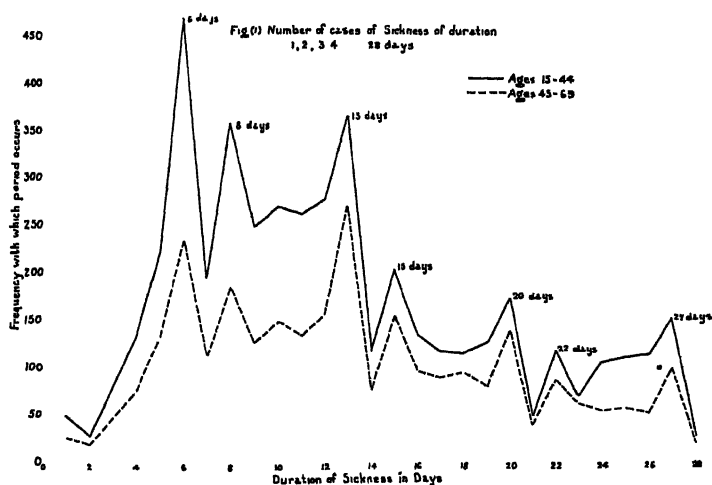
Duration.	Number of Cases falling within the Group.		Number of Cases as Percentage of Total Cases.	
	Age 16-44.	Age 45-69.	Age 16-44.	Age 45-69.
1-14	3058	1709	56	45
15-28	1400	1067	25	28
29-42	506	478	9	13
43-56	295	284	5	8
57-70	157	148	3	4
71-84	88	100	2	3
Total	5504	3786	100	101

Going a step further, analysis was made of the sicknesses lasting up to one month according to their duration in exact number of days. The result is shown for the two age groups in Table XV and Fig. (i). The periodicity of the two series is somewhat remarkable. The curves follow one another with nearly absolute parallelism, the only definite distinction being that the modal value for younger workers is 6 days and that for older workers is just one week more, or 13 days. In both cases there is an abrupt and considerable rise in the frequencies at 6, 13, 20 and 27 days, and a secondary but less considerable rise at 8, 15 and 22 days. In both cases there is a distinct fall in frequencies at 7, 14, 21 and 28 days. These "peaks and valleys," therefore, follow one another with absolute regularity at intervals of one week. In between the secondary peak and the following primary peak there is in both cases a plateau of virtually equal frequencies. Unable to supply a reasonable interpretation of these distributions, I pursued the question a little further by examining for a sample,* the actual days of the week upon which sicknesses of given duration began and ended. The examination was made for one week's period—for all durations from 6 to 12 days. Since each weekly section of the curve is only a reproduction of the last (on a

* The samples for each duration 6, 7, 8 . . . 12 days were of different sizes, and to allow comparability between the different days of the week the frequencies were expressed as percentages of the total in each sample.

TABLE XV.
Number of Cases of Sickness of Duration.
 1, 2, 3, 4 . . . 28 days.

Duration.	Number of Cases.	
	Age 15-14.	Age 45-60.
1	47	23
2	26	15
3	80	43
4	135	72
5	219	130
6	466	230
7	193	110
8	354	183
9	246	125
10	271	146
11	259	137
12	279	153
13	369	268
14	114	74
15	200	150
16	136	93
17	119	86
18	116	91
19	128	76
20	170	135
21	45	35
22	110	84
23	66	59
24	53	50
25	57	53
26	65	47
27	97	91
28	29	17
Total	4458	2776



lower scale), it is unnecessary to examine more than one such section, and the results can be confidently applied to the other sections. The answers supplied by this final analysis are given in Tables XVI and XVII and Figs. (ii) and (iii), and they throw a rather interesting sidelight on sickness statistics. Turning first to the marginal totals for the columns relating to the days on which sickness *began*, it is seen that there is, for both age groups, a very much larger number of claims beginning on the first days of the week than there are claims beginning in the latter part of the week. The frequencies form an orderly descending series from Monday to Saturday (Sunday begins and ends a negligible number of claims). At ages 16-44 the number of claims beginning on a Monday was 153 out of a total of 699; beginning on a Saturday there were only 57. In the older age group the number beginning on a Monday was 161, on a Saturday 66. Between the two age groups there is but little distinction in the distributions according to day of onset, and the small differences observed are probably not significant, since the samples for the varying durations were only in the neighbourhood of 100 apiece. Transferring one's attention to the marginal totals relating to the days on which sickness *ended*, the enormous preponderance of claims concluding on a Saturday is immediately striking. Amongst workers aged 16-44 out of a total of 699 claims, 347, or 50 per cent., ended on a Saturday; amongst workers aged 45-69 out of a total of 695 claims, 361, or 52 per cent., ended on a Saturday. This strong tendency for a claim to conclude on a Saturday is shown very clearly in Figs. (ii) and (iii), where the great excess ending on this day is apparent whatever the day sickness began upon. Apart from Saturday there is some excess of claims concluding on a Monday compared with other days of the week. The series is a descending one again, there being less likelihood of a claim concluding on a Thursday or Friday than on a Monday or Tuesday. In other words, if the worker does not return to his work at the beginning of the week he tends not to return till the following Monday.

Considering the divisions of the tables and the columns in the diagrams, it is observed that the workers who do return to work in the middle of the week tend to be sick for exactly a week. There is a bias for sickness that began on a Tuesday to end on a Monday; that which began on a Wednesday to end on a Tuesday; that which began on a Thursday to end on a Wednesday, and that which began on a Friday to end on a Thursday. Sicknesses beginning on a Monday seem to be in a class apart; if the bias towards conclusion on a Saturday has not been operative, the tendency is for the sickness to continue over the following Monday, lasting 8 days. (With

older workers according to this sample it often continues over the Tuesday as well.)

This analysis, I think, allows an interpretation to be made of the curves shown in Fig. (i). The peaks at 6, 13, 20 and 27 days are due to the proneness for sickness to begin on a Monday and conclude on a Saturday, a tendency which results in exactly these durations. The secondary peaks at 8, 15 and 22 result partly from what may be termed a "secondary" proneness for sickness that begins on a Monday to end on a Monday (*i.e.* the return to work does not take place till Tuesday and the duration of absence is 8, 15 or 22 days). The workers who return to work in the middle of the week tend to be absent exactly 7, 14 or 21 days, but, on the other hand, these durations cannot be reached (except rarely) in conjunction with the very much greater bias towards concluding sickness upon a Saturday, since this presumes "signing on" sick upon a Sunday. Where sickness begins upon a Monday, and, as has been seen, there is a bias towards this, it tends to end upon a Saturday and thus contribute to the 6, 13, 20, 27 peaks; or, secondly, to end upon the Monday and thus contribute to the 8, 15, 22 peaks. It cannot conclude upon a Sunday and thus does not contribute anything to the duration 7, 14, 21. Similarly, workers who would perhaps sign on upon a Sunday begin sickness either upon the Saturday or the Monday, and, declaring off mainly upon a Saturday, again eliminate the durations at 7, 14 and 21, and contribute to both the primary and secondary peaks. Thus the absence of sicknesses beginning or ending upon Sundays in conjunction with the tendency for them rather to begin on the first days of the week, and still more to end upon a Saturday, necessarily eliminates periods of durations 7, 14 and 21 days. The main interest of this analysis lies in the explanations that should be assigned to this heaping up on particular days of the week. The greater number of sicknesses that begin on the first day or two in the week and the defect on the concluding days of the week must be due to the natural tendency for workers to endeavour in spite of illness to complete the week's work, perhaps hoping to recuperate at the week-end but eventually being compelled to "go sick" at the beginning of the next week. The most striking bias revealed, that is, to conclude sickness upon a Saturday, is open to two interpretations. It may be that once a week has been broken into the worker tends to consider it not worth while to return to work. The more the week is advanced the closer will be the level of income whether drawn by a return to work or by completing the week's sickness. In other words, the period of sickness is unduly extended. Alternatively, the reverse interpretation may be true—that workers are loath to break into a

second week's work, and therefore conclude their period of sickness at the end of a week whether they are fully recovered or not. The same alternatives may be applied to the bias towards being away from work just a week revealed by the mid-week frequencies. Naturally both tendencies together may be operative. The question seems to be one that is worthy of more attention. The characteristics of the distributions are very definite and the interpretations to which they lead must give rise to some concern. If persons stay on at work in spite of sickness or return to work before they are fully recovered, it is probably detrimental to their health in the long run, and in the case of infectious diseases conduces to the spread of infection. Alternatively, if there is a tendency to continue a period of sickness to the end of a week irrespective of recovery, it is a practice that must be very costly to the National Health Insurance system. In long sicknesses it would be reasonable to conclude the convalescent period at the close of a week, and the extra cost involved in relation to the total would be small. But where the whole period should be of a duration less than two or three weeks, the addition of three or four days bears a relatively high ratio to the total cost. Sicknesses of such duration, it has been shown, form a half to three-quarters of the total of all sicknesses under three months. Sir Alfred Watson has suggested that the substantial reduction in sickness claims during the war was in part due to the "will to work" during those years. If this tendency for sicknesses to conclude on a Saturday is due even in part to a lack of a "will to work" it is a question that merits further study. In addition it emphasizes the weakness of the definition of sickness with which, in using National Health statistics, one is forced to be content. Sickness can only be defined as absence from work certified by a practitioner as due to incapacity to work. This analysis makes clear that the absence from work cannot really represent the true period of incapacity; it must either overstate or understate it, so that the criterion of "sickness" is quite inexact.

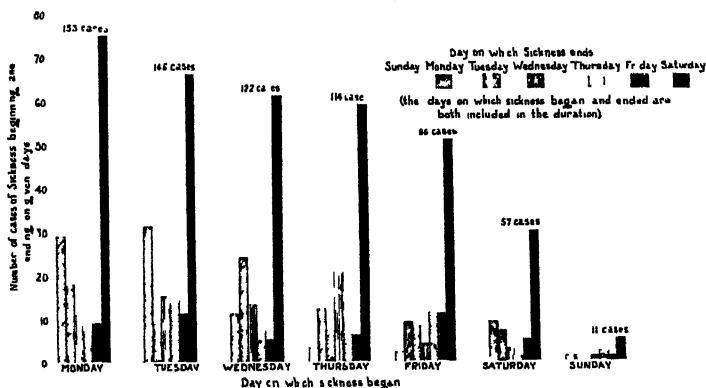
(2) *The seasonal distribution of sickness.*—Sir Alfred Watson has provided some interesting data concerning the seasonal fluctuations of sickness. He examined the monthly variations in expenditure of a number of societies and showed, for the years 1920 to 1926, the average daily numbers of claims for sickness benefit in each month. He concluded "that sickness resulting in claims for benefit is at its minimum in the months July–September and thereafter gradually rises, not, however, reaching the peak until February or March, as a rule. . . . Apart from the abnormalities of 1926, perhaps the most interesting features are the comparative constancy of the claims over a large part of the year and the effect of the

TABLE XVI.

Number of Cases of Sickness lasting between 6 and 12 days (inclusive) that begin and end on particular days of the week. Ages 15-44.

Day on which sickness ended.	Day on which sickness began.							Totals ending on stated days.
	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.	
Monday ...	29	31	11	12	9	9	1	102
Tuesday ...	18	9	24	7	8	7	0	73
Wednesday ...	12	15	13	21	4	3	1	69
Thursday ...	7	14	7	6	11	2	2	49
Friday ...	9	11	5	6	11	5	1	48
Saturday ...	75	66	61	59	51	30	5	347
Sunday ...	3	0	1	3	2	1	1	11
Totals beginning on stated days	153	146	122	114	96	57	11	699

Fig. 11. Number of cases of Sickness lasting between 6 and 12 days that begin and end on particular days of the week Ages 15-44



winter fluctuations in producing 'bad years' from the point of view of expenditure on sickness benefit." *

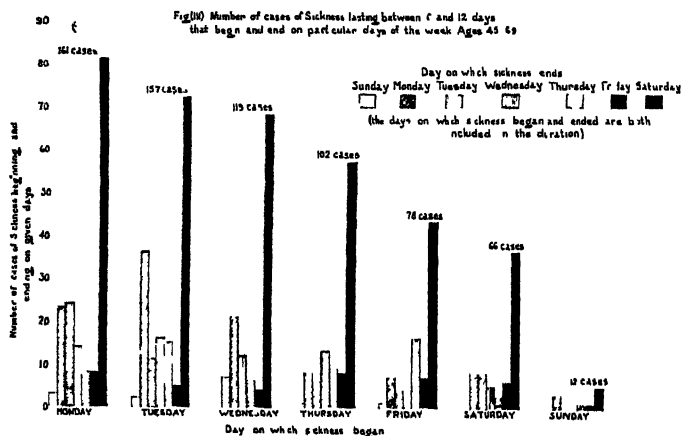
Using a sample of the printers' experience I have examined the seasonal fluctuations for particular cause groups of sickness (the cause groups are the same as those shown on p. 186). The numbers of claims beginning in each month from each cause are set out in Table XVIII, each number being expressed as a percentage of the total number of claims from that cause in the year. The cause

* "National Health Insurance: a Statistical Review," *Journ. of the Royal Stat. Soc.*, Vol. XC. Part III. 1927.

TABLE XVII.

Number of Cases of Sickness lasting between 6 and 12 days (inclusive) that begin and end on particular days of the week. Ages 45-69.

Day on which sickness ended.	Day on which sickness began							Totals ending on stated days.
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Monday	23	36	7	8	7	8	3	92
Tuesday	24	11	21	6	4	8	0	74
Wednesday	14	16	12	13	0	5	1	61
Thursday	8	15	6	9	16	3	1	58
Friday	8	5	4	8	7	6	1	39
Saturday	81	72	68	57	43	36	5	362
Sunday	3	2	1	1	1	0	1	9
Totals beginning on stated days	161	157	119	102	78	66	12	695



fluctuating in most pronounced fashion is influenza; in this experience nearly one-quarter of the claims fall in January, one-fifth in February and one-seventh in March, or, in other words, 57 per cent. of the claims are in the first three months of the year. The frequency falls to a minimum in July and August and then rises slowly again. But the level at the end of the year is far below that found at the beginning, for November and December contain only 7 and 8 per cent. of the claims against the 23 and 19 per cent. of January and February.

The only other cause group that at all compares with influenza

in the magnitude of its fluctuations is that comprising the respiratory diseases. These follow the same course as influenza, with a maximum in January and minimum from June to August. Its range of fluctuation is, however, considerably less. In the first three months of the year, 15, 12 and 11 per cent. of the respiratory diseases are found against the 23, 19 and 15 per cent. for influenza. On the other hand, the summer level of the respiratory group never quite reaches the low point touched by influenza, and the rise at the end of the year is more pronounced: 34 per cent. of the respiratory claims are recorded in the final quarter of the year and only 20 per cent. of the influenza claims. No other cause groups show seasonal movements on anything like this scale. Yet some movement is apparent for practically every type of incapacity. In most cases, similarly, a high percentage is to be found in January, a low rate in mid-year and a rise in the last quarter. Ignoring apparently random fluctuations due to small samples, this seems to be the course of rheumatic complaints, circulatory diseases, nervous diseases (constant over the greater part of the year), digestive diseases, and diseases of the naso-pharyngeal tract. This last group (sore throat, rhinitis, tonsillitis, etc.) has its maximum in the final months of the year and not in the first quarter: 34 per cent. of its claims fall in the last three months of the year and only 22 per cent. in the first three months.

With tuberculosis the sample is a small one and nothing but random fluctuations are apparent. Skin diseases show no definite seasonal variation, and the general group of "other causes," after a high January rate, is virtually constant over the year. According to this experience accidents and injuries are at a maximum in January, fall to a minimum in March and thereafter rise throughout the rest of the year; but the range of variation is small. The fact that the maximum in this experience is in most cases in January, and in Sir Alfred Watson's material is in February to March, is explicable by the different treatment of the data. Sir Alfred Watson took the average number of claims *current* in the month, while I took the number of claims *beginning* in the month. Obviously, if a larger number of claims begin in January than in December, considerably more will be carried on from January to February to be recorded as still current than from December to January, so that the February total may be sufficiently increased to surpass that of January. In addition, for 1920-23 Sir Alfred Watson's figures did not correspond exactly to the month, but to the first three (or four) pay-weeks of the month against which they are shown and the last pay-week of the previous month, which would again tend to push the maximum later into the year than in my sample.

Comparing the distributions for the sickness cause groups with the seasonal variations in deaths given for 1921–25 in the Registrar-General's Statistical Review for 1925 (England and Wales), I found that influenza followed very much the same course, but that the maximum for deaths was in February. For rheumatoid, etc., arthritis, nervous diseases, respiratory diseases (maximum in February) and digestive diseases (other than diarrhoea), the distributions of deaths also bear resemblance to the distributions for sickness claims, but no close comparison is possible, since the deaths relate to persons of both sexes and of all ages, and the sickness data are confined to males between 15 and 70 years of age.

TABLE XVIII.

The Seasonal Variation in Sickness Claims. The Number of Claims from Various Causes beginning in each Calendar Month expressed as a percentage of the total Number of Claims from that Cause during the year. Printers' Experience, 1921–25 (sample).

Month.	CAUSE GROUP.									
	Influenza.	Pitchitis.	Rheumatism.	Respiratory.	Naso-pharyngeal.	Circulatory.	Digestive.	Nervous.	Skin.	Other Causes.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
January .	23	11	9	15	10	10	9	12	8	11
February .	19	8	10	12	7	9	8	8	8	7
March .	15	10	10	11	5	8	9	8	10	9
April .	7	10	8	9	6	8	8	7	8	8
May .	5	7	9	7	8	8	7	8	7	7
June .	3	6	8	4	7	9	7	7	9	8
July .	2	10	7	3	6	7	8	10	8	9
August .	2	6	6	4	7	6	8	7	6	8
September .	4	9	8	6	8	7	8	8	10	9
October .	5	9	8	8	11	9	10	9	11	9
November .	7	8	9	11	13	10	9	9	8	10
December .	8	7	8	10	10	7	8	8	8	9
Total number of cases in the year.*	2730	471	1419	1928	601	714	1237	704	930	1202

* These totals must not be used for comparison of the relative frequencies of the diseases, one with another, since the samples taken for each group were compiled so as to be of sufficient size in each case, irrespective of the frequencies of other groups.

One point to which Sir Alfred Watson refers is the fallacy involved in a local "census of sickness" in any particular month, such as

has been carried out in America. The seasonal and yearly fluctuations in sickness that he shows prove that this is not a valid statistical method of enquiry. With this analysis of sickness variation by cause perhaps one may add that with practically no type of disease could the method be entirely valid. With such diseases as influenza and respiratory complaints it would lead to great inaccuracies, while with most other diseases, although the range of fluctuation is not so great, it could not be held that a census in any particular part of the year would give a true picture of the normal prevalence.

(3) *The "free year."*—One of the clauses in the National Health Insurance Act states that when a person (other than a woman employed contributor who ceases work on marriage), having been insured as an employed contributor, ceases to be employed within the meaning of the Act (*e.g.* by giving up work, setting up for himself, etc.), he ordinarily remains an insured person and entitled to all benefits for one year after the end of the week in which employment ceases. This is termed the free year. The person pays no further contributions but yet remains a member of his Society, and can draw, in event of sickness, full benefits.

In dealing with sickness statistics drawn from Approved Societies the method of treatment normally adopted is to include the free year in the duration of exposure to risk, and, of course, any incapacity recorded in this year is added to the total of incapacity suffered by the population. In other words the denominator of the fraction (the exposure to risk) is increased by the inclusion of the free year; the numerator is increased by the inclusion of any incapacity recorded in the free year. A point that suggests itself is as follows: is the tendency to draw benefit for incapacity the same in the free year as in years of ordinary insurance, or is there a comparative deficiency in the number of claims made, either through insured persons' lack of knowledge or through neglect of their rights? Obviously if there were such, the final sickness rate obtained would be slightly too small; the denominator would have been increased, whereas the numerator would not have increased in its proper proportion.

To test this point I took out the exits of this type amongst the printers for the years 1923-25 and analysed them according to whether the persons involved made claims in the free year and/or in the year previous to the free year. During the years 1921-25 the rates for all printers rose slightly but nearly steadily, so that the number of claims made in the free year ought, at least, to be equal to the number made in the previous year. This was not found to be so. There were 877 such exits, and of these 763 made no claim in either year. Of the 114 persons that had some incapacity, 90

made claims in the year previous to the free year but not in the free year; 17 made claims in the free year but not in the previous year; and 7 made claims in both years. In other words, only 20 per cent. of these claimants were taking advantage of their rights in the free year. The inclusion of the free year in the exposure to risk, according to this experience, certainly results in some slight understatement of the sickness rate. On the other hand, this is probably negligible in view of the proportion the free year bears to the whole exposure. In addition, this analysis relates to the years 1921-25, and undoubtedly every year adds to the insured population's knowledge of its rights.

(4) *Repeated sickness claims.*—The measures usually adopted for assessing sickness incidence are the number of days of sickness per unit of exposure, the number of claims per unit of exposure, and the number of days per claim. No distinction is then drawn between claim and claimant, and it may be of some interest to see what is the proportion of persons in a population that suffer incapacity over a certain period, and with what frequency persons exist who make repeated claims.

In the investigation amongst weavers it was found that in one year's experience 19 per cent. of the males suffered from incapacity, compared with 21 per cent. of the single women and as many as 39 per cent. of the married women. This relates to persons of all ages. The data relating to printers being more extensive I analysed

TABLE XIX.

Printers' Experience. The Percentage in each Age Group that made a claim (or claims—Sickness and Disablement) for Benefit over the five years 1921-25. Males (those exposed for the whole period only).

Age Group * (age last birthday at 1.1.31).	Total in Group.	Percentage of Total who made no Claim.	Percentage of Total who claimed once or more than once.
16-24	461	52	48
20-29	1,485	56	41
25-34	2,132	56	44
30-39	3,026	60	40
35-44	3,038	57	43
40-49	3,226	57	43
45-54	3,143	56	44
50-59	2,592	53	47
55-64	1,719	50	50
60-69	993	41	59
All ages	21,815	55	45

* Since the ages were taken at 1 1 21 and the claims over five years, the age groups must overlap.

them according to age. The percentages making claims over the five years 1921-25 are set out in Table XIX. In the first age group, 16-24 years, 48 per cent. of the population make a claim to benefit. This is a relatively high rate, for it is not reached again until ages 55-64, but this initial high rate (as pointed out previously) may be peculiar to this experience. The percentage making claims is nearly stationary from age 20 to age 54, being 43 to 44 per cent., with the exception of a slight, and perhaps insignificant, dip at ages 30-39, when only 40 per cent. make claims. This is the minimum reached. After the age group 45-54 the numbers falling ill increase. At ages 55-64 half the population have incapacity during the five years, and in the final age group 60-69 the percentage rises to 59. Just under half of the population at all ages make some claim during the five-years period.

TABLE XX

Printers' Experience. Number of Persons making repeated Claims (Sickness and Disablement) for Benefit expressed as a Percentage of the total Number of Claimants in each Age Group. 1921-25.

Age Group (age last birthday at 1.1.21).	Total Number of Claimants.	Percentage making Claims.					
		1.	2-3.	4-5.	6-7.	8-9.	10 and over.
25-39	2149	60	32	6	1.4	0.4	—
35-49	2691	59	33	7	1.4	0.3	0.1
45-59	2622	54	34	8	0.3	1.2	0.4
55-69	1455	51	36	8	0.3	0.4	0.7

The number of persons who make repeated claims over the five years is shown in Table XX for four broad age groups. (The first age group has been discarded as probably too peculiar to this experience.) It is seen that the number of persons who make only one claim falls steadily with age. This group forms 60 per cent. of the total claimants at ages 25-39, and has fallen to 51 per cent. at ages 55-69. The number making two or three claims rises from 32 per cent. in the first age group to 36 per cent. in the final age group. The older age groups throughout show a higher percentage of multiple claims, as would be expected, although, on the other hand, the longer duration of sicknesses at these ages allows less opportunity for repeated claims, so that the differences are in this sense understated. Persons making over eight claims in five years form a negligible proportion of the total population. It may be stated that the highest number of claims made by one person in this five years' experience was eighteen.

Miss E. M. Newbold, using a sample of these data, has shown in a paper read to this Society that these distributions of repeated sicknesses cannot be fitted by any simple chance scheme (such as the Poisson limit).*

Much of the heavy labour of card-sorting and calculation involved in this investigation has been carried out by Miss G. Salmon, and it is a pleasure to acknowledge my indebtedness to her.

DISCUSSION ON DR. HILL'S PAPER.

PROFESSOR GREENWOOD: The Society has been very fortunate in the last few years in securing at their meetings accounts dealing with the more striking statistical features of investigations carried out in the public service. One remembers the interesting contributions of Mr. Hilton with regard to sampling; Mr. Flux and his colleagues at the Board of Trade have put before the Society scientifically interesting aspects of work carried out in their Department. Respecting the study of sickness, it is less than two years since we had the advantage of hearing an admirable account of some of the work of the Government Actuary's Department by the greatest master of the subject now living. It is obvious, of course, that Dr. Bradford Hill's field of study is very much smaller than that covered by Sir Alfred Watson, and it is high praise of a young investigator if one can say with truth—and I am sure one can do so in this case—that in some points he has made an interesting addendum to what we learned about sickness and insurance statistics two years ago.

I do not propose to touch at all upon any of the points in which Dr. Hill's researches follow the same lines as Sir Alfred Watson's, with one exception—and that is not an exception because it is a question of the extension of an analysis made by Sir Alfred Watson—I mean the change in the secular incidence of certified sickness. Sir Alfred Watson pointed out that the period of stability that might be expected to arise when the selective effect of beginning with a *working* population had ceased to operate, was not yet manifest. Dr. Hill has followed the claims that arise from year to year on account of particular cause groups. With respect to one large contributor to sickness in the years he covers—namely, influenza—the test that he applies may not be entirely sufficient. I do not think one is entitled to say that the mortality of influenza is a perfect criterion of its morbidity. In 1918 the morbidity in the first wave of influenza was probably as great as, or greater than, the morbidity of the autumn wave, but the fatality and the mortality—the ratios of deaths to cases and of deaths to population—in the autumn were

* "Practical Applications of the Statistics of Repeated Events," *Journ. of the Royal Stat. Soc.*, Vol. XC. Part III. 1927.

much greater than in the summer. Similarly it is not improbable that the present incidence of relatively non-fatal influenza may be greater than it was in 1922.

That leads me on to what seems to me to be an important difficulty of the whole question of morbidity investigations. I will not poach upon our valued colleague, Sir William Hamer's, field of work, "What is Influenza?" but I suggest that it is not very improbable that many illnesses covered by the simple word "influenza," which form so large a contribution to morbidity, were as prevalent before 1918 but not so often called influenza. I am confident that a great deal of sickness from 1847-90 would now be classed under the heading of influenza.

This leads me to support what might appear to be a very crude classification of the causes of morbidity. No doubt statisticians could point out great logical objections to the classification Dr. Hill has made, and actually at the moment the question of the classification of causes of morbidity is of some international concern. There are statisticians who believe that provided one constructs a sufficiently logical classification of rubrics, it is possible to compare the incidence of sickness in different countries. I suggest that Dr. Hill's study throws further doubt upon the practicability of this.

The last portion of the summary that was read naturally interests us because of the neatness of the demonstration. It is hardly necessary to be reminded that it is clearly possible, within fairly wide limits, to determine when one shall, officially, fall sick or recover, but not when one shall die. Therefore there is not only a quantitative, but also a qualitative difference between statistics of mortality and morbidity. I suggest that there is considerable danger of over-elaboration of statistics of morbidity, and it is perhaps only by the method of sampling, as used by the Ministry of Health's Rheumatism Committee, and by studying the experiences of selected practitioners with regard to the incidence of various causes of morbidity on a relatively small scale, that detailed analysis is practicable. A comparatively crude classification such as Dr. Hill's is all that can be safely used when general data are in question. I think that has been very well brought out, and I will conclude by proposing that the Society's thanks be accorded to Dr. Bradford Hill for his valuable paper.

MR. UDNY YULE: I am afraid I must begin with an apology, as, in addition to undertaking the duty entrusted to me by the Chairman, I am afraid I cannot enter into any great detail of appreciation on the paper. Had Mr. D. R. Wilson been able to be present he would have seconded the vote of thanks to Dr. Bradford Hill, but unfortunately he has been prevented by illness. I have read the paper, but not immediately before the meeting, and unless one has studied such a paper immediately beforehand, it is impossible to make any useful contribution to the discussion.

Dr. Bradford Hill's whole work has interested me very much, and I think all will agree that the Society is fortunate in having

such a paper, and that Dr. Hill's explanation of this very difficult subject is extraordinarily lucid and clear. Professor Greenwood has already dealt with the fundamental difficulty—that the initial statistics are so often not comparable when they originate from different people. The diagnoses are different. At the same time, Dr. Hill's work makes it hopeful that *something* can be obtained if the investigation does not attempt too fine a classification. I hope Professor Greenwood will agree that it may, for example, be regarded as a real result that morbidity due to the digestive diseases is more common among textile workers than among printers.

One of the sections of the paper that interested me most—although on a side issue—is the discussion in Part III of the shorter durations of morbidity, and the curious facts regarding the days of the week on which claims are likely to begin and end. You have there a beautiful picture of the effect of the psychological factor on these data. It illustrates at once another difficulty of morbidity statistics.

We shall all, I am sure, hope that Dr. Bradford Hill may be able further to continue these investigations, on which I know he is still working, and I am sure he will be able to produce further work of interest. It is of great importance that the data should be investigated, for it is only by labour such as his that we can really test their value.

I beg formally to second the vote of thanks.

DR. H. M. VERNON said that he had read the paper with great interest, not only because of the intrinsic importance of the subject, but because Dr. Hill had dealt with it in such an illuminating manner. Probably Dr. Hill would be ready to agree that there was no finality about his results. Statistically they were reliable, but one had to be extremely cautious in interpreting what they meant. It did not follow because one group of workers had more sickness claims than another that that particular group had incurred more sickness. Dr. Hill had shown in a convincing manner that the duration of the sickness depended on the day on which it was incurred, and his results indicated that over half of all the workers conveniently ended their illness on a Saturday, so that they would be able to return to work on the following Monday. He showed that the married weavers had more than twice as much sickness from almost every cause as the unmarried. Was that statistical result to be taken at anything like its face value? Not for a moment. Married women constantly had the claims of home and family life thrown upon them, and if at any time they happened to be "off colour" they would take a few days off from work. Having stayed away for a few days, the married woman would not be as ready to go back. This might be thought to be rather an extraordinary statement to make, but in support of it he would like to mention something of a somewhat similar sort which was observed by Dr. Bedford and himself in a different industry—coal-mining. Statistics of absenteeism were taken of 23,000 miners for two to six years, and the atmospheric conditions of the ten mines in which they

worked were investigated. It was found that the men working in the deep and hot mines showed a great deal more absenteeism from accidents than the men in the cool and shallow mines, but when the statistics were sorted out according to the severity of the accidents, it was found that major accidents entailing an absence of over ten weeks were just as frequent in both types of mine, though minor accidents, entailing less than ten days' absence, were four and a half times more frequent amongst the men working in the hot mines. There was no reason for thinking that there was a greater frequency of one class of accident in some mines than in others, but the men in hot mines had a much more unpleasant job than those in the cool mines; so when a minor accident occurred they took it as a reasonable excuse to go on accident compensation pay.

The point about the paper that specially interested Dr. Vernon was Dr. Hill's conclusion that weavers, male and female, had much more sickness from gastric disturbance than workers in printing and other industries. It seemed to him that a result of that sort ought to be a starting-point for further investigations into the causes of that sickness. It might be dependent on the fact that in the weaving industry there was a very large number of married women. A married woman, weaving all day, had no time to look after the food of the family, and consequently the meals might be badly cooked, and cause gastric disturbance both in herself, her husband and her children. If there were anything in that suggestion, it would be possible at any rate to diminish the evil by having canteens in all the mills where good food would be supplied at cheap rates.

Dr. Hill had come to a very important conclusion with reference to phthisis in machine workers and compositors. That was one of the points that needed further investigation. It might be due to the fact that so much work had to be done by night. Printers of newspapers worked chiefly by night, and one would expect a very marked difference in printers of books who worked by day.

In conclusion Dr. Vernon said that he thought Dr. Hill's results, although they had no finality, ought to be taken as a starting-point for a number of other investigations in order to clear up the problems raised by him, and statisticians and others were greatly indebted to him for bringing these investigations before them.

MR. ROBERT A ABABRELTON said that as the President had asked for suggestions he would like to make one with reference to the paper. He had come in contact with diseases because he was one of those who was unfortunate enough to undertake duty for the Government as a clerk for a Military Service Tribunal during the Great War. At these Tribunals various groupings were made. Those persons who were supposed to be in full health were called "A," "A 1" being the very best. Persons not quite so healthy were grouped as "B," and below that came a "C" category which was divided into 1, 2, and 3, and "C 3" was the very lowest. He had seen it stated over and over again in the public Press during recent years—though not in any paper in connection with the Royal

Statistical Society—that the nation was supposed to be a “C 3” nation, because such a tremendous number of diseased persons came before the Military Tribunals. The reason they came before the Tribunals was because they were considered fit for military service by the military authorities, and anyone who had the least thing wrong with him came to the Tribunal and pleaded for exemption. The doctor came forward, made a great fuss, and in many cases the man would be excused military service in consequence. Mr. Ababrelton’s suggestion was that he would be glad if some of our excellent statisticians would set to work to prove to the public in general how untrue it was that this nation was a “C 3” nation. It was nothing of the kind, and all who had had anything to do with industry knew that very well. Many a man with very little wrong with him was labelled as “C 3” and thereby escaped military service. One doctor received three years’ imprisonment for certifying men as “C 3” when they were not so, and there were somewhat similar cases during the war years in different parts of the country.

MR. G. H. WOOD hoped there might be room for a few words on one or two of the problems from quite a different point of view. He was not a doctor, and in Dr. Hill’s sense of the word he was not a statistician, but he was President of an Approved Society of about 7,000 people, 95 per cent. of whom were engaged in the wool textile industry of Huddersfield and district. He would like to make one or two observations arising from his experience. His Society had been perplexed over and over again at the recurrence of the phenomenon of the Monday start and the Saturday termination. Clearly, as Dr. Hill said, this might result in an under-measurement or an over-measurement of sickness, according as one looked at it. It was the view of his Society that, on the whole, it had the effect of under-statement, but—and this was the second point he wished to make—that varied very considerably with the amount of employment offering itself. If there was plenty of work going, a man would stay at home at the week-end, not going to the mill on the Saturday morning, stay in bed Saturday and Sunday, and go to work again on Monday. If work was good after a bad spell, and full-time employment, or a reasonable proportion of full time was offered, then there was a tendency to get back to work as soon as possible, or not to go on the funds at all. If, on the other hand, work was not full, there was a great temptation to have a week off. It was quite proper that it should be so, and on the whole his Society did not feel that it was a costly business. He did not think that the administrators of Approved National Health Societies felt that that could be sufficient grounds for levelling a charge of malingering. The British workman did want to get back to his work, and would often carry on with ailments which meant that he was not fit for work at the moment, and he would go on until he must give up unless the amount of money which would come into the household was fairly near the amount which would come in if he were at work. If he was only earning part-time wages, it was easier for him to

see the doctor, stay away and draw three days' pay. In these circumstances there was a tendency to go on to the end of the week.

To sum up, Mr. Wood said that the experience of his Society was that in time of full employment the Monday start and Saturday finish under-stated the actual amount of physical unfitness for work through illness, but when employment was bad there was a tendency to over-statement, although that tendency was not sufficient to amount to any charge of malingering.

LIEUT.-COL. H. O. BOGER suggested that valuable information might be obtained from Employment Bureaus; he had in mind the Juvenile Apprenticeship Committees all over London, and he thought the Secretaries of these Committees had very clear information on all sorts of industries, including the printing industries, that might prove very valuable.

COLONEL BUTLER said that Dr. Hill had referred to some of the difficulty that arose from the classification of illnesses responsible for invalidity and claims under the Insurance Act. On looking through the paper, on page 184, it struck him that if the outstanding groups of diseases responsible for the greater part of invalidity were taken, it would be found that there were three chief groups :—

Influenza,	which claimed	137.7	per 1000.
Bronchitis, common colds	„ „	201.1	„ „
Lumbago and rheumatism	„ „	103.0	„ „

When the character of these diseases was considered it would be found that many were indistinguishable in the earlier stages the one from the other. Rheumatism was a disease that covered a multitude of sins and in the early stages could not be diagnosed as an entity even if it was one. It might be a complication of influenza or scarlet fever, or an attack of acute rheumatism. Catarrhs, colds, particularly feverish colds, in the period before the 'nineties, when the name "influenza" came into more general use would have yielded the same kind of invalidity as that classified as influenza during the later period. Symptoms were often labelled as diseases, and returns of symptoms such as, for instance, "lumbago," which might be merely a symptom of influenza, masked the prevalence of a disease only partially diagnosed. The items in the group of diseases to which he had referred were in practice interchangeable, and what at one time and in one set of circumstances appeared in the returns say as "influenza," at another appeared as common cold.

It would be very desirable if a symptom-group of that kind which accounted for most short-time invalidity, particularly such a group as influenza, common colds, lumbago, rheumatism, could be classified as a whole with variable constituent units, the part they individually played being recognized as interchangeable quantities. The time might come when influenza might be as definitely distinguishable a disease as tuberculosis, and when it might be

detached from the group in which at present it was indistinguishably merged.

MR. DUDLEY WALTON asked if they were to understand from Dr. Hill that his general experience was that the statistics relating to National Health Insurance did not at all correlate with those of the nation at large, and that there were peculiarities respecting various occupations and also respecting insured persons which were different from those of the rest of the population? He was not clear on that point, but rather gathered that Dr. Hill emphasized that there were differences.

DR. ISSERLIS said he only wished to add a particular word of congratulation to the author of the paper. He had been struck with the excellent scientific restraint displayed by Dr. Hill. He had shown an interesting phenomenon—the Monday to Saturday absence—and he said, quite rightly, that it might be explained in one way or in another; it might be an under-statement or an over-statement, but that, as he had not put it to the test, he just left it there, quite wisely. To-night, one of the speakers who was familiar with that aspect of the subject, gave from his experience the opinion that one interpretation was more likely than the other.

It was most excellent to be restrained in this way, and Dr. Isserlis wished to emphasize the fact that a verdict of “unproven” did not mean that the prisoner was probably guilty, because the interesting illustration given by Dr. Vernon in another field might lead one somewhat astray. It would perhaps be well to emphasize the fact that what was probably meant by Dr. Vernon, was that he had not come to a definite conclusion that there was a difference in the incidence of miners’ accidents as between hot mines and cool mines; it was merely an illustration that one interpretation or another was possible, and that that was an unproven point; in a scientific analysis of such data, the correct attitude was the attitude followed by Dr. Hill.

MR. FLUX wished that the discussion could have been continued a little further. He was afraid that the sickness to which the paper had been devoted had perhaps explained the absence of some of those who would have been glad to assist the discussion; at any rate, they had the advantage of having placed on record, in the printed Proceedings of the Society, an account of an investigation of extreme interest. It was outside his own field, but after having been occupied with figures for a good many years, one felt an interest in watching any game with figures, and he had found a good deal of interest in the investigation carried out by Dr. Hill.

He would make only one observation, however, on the ground that he did not wish to trespass upon territory where he was a stranger, and that was on the question of the dominance of Saturday. He thought that perhaps the Saturday lines on pp. 223–224 ought to be divided by 2, because in the main Sunday was not an insurable day. There were certain occupations in which it was insurable, but

generally speaking it was an off-day, and the periods of sickness which terminated on Sunday should be taken into account with those which terminated on Saturday; by dividing by 2 they would be put into their proper perspective with regard to the other days. Even so they stand out in a particular way and call for all the observations that had been made. It would be of interest also to know how far the fact that Saturday was a half-day might contribute; often it would not seem worth while to go back to work for half a day, and, as had been mentioned by other speakers, the opportunity would be taken to get thoroughly over the illness. Mr. Flux said he was merely suggesting that the degree in which there was a perversion of figures regarding bouts of sickness ended on Saturday was much less than the diagram at first sight suggested. That was the only observation he would make, and it in no way qualified the fascination of the observations put forward by Dr. Hill.

The vote of thanks proposed by Professor Greenwood and seconded by Mr. Udny Yule was put to the meeting and carried unanimously.

DR. BRADFORD HILL: I am very much indebted to the Fellows of the Society for the kind and lenient way in which they have received this paper. On one point—the division of sicknesses into cause groups—I must say that I felt considerable misgivings. I feared that someone medically qualified would object to this or that, and being myself without such qualification I was determined that discretion was the better part of valour and I would make no reply. I am therefore much relieved to have Professor Greenwood's support of this admittedly crude grouping. Colonel Butler is right in pointing out that even these wide groups cannot possibly be quite distinctive, but must overlap one another, in some cases, quite possibly, very considerably. I agree with Professor Greenwood in his objection to my use of influenza mortality figures. The mortality is not definitely related to the case incidence, and my attempt to see whether the rise in those claims was due to epidemic causes or not by comparing the movement of morbidity and mortality is not absolutely sound. The result reached is, however, I think, suggestive, and bears out those reached from the other cause groups.

I hope Dr. Vernon does not think that I have shown a lack of caution in interpreting these sickness statistics. My own opinion is that it is hardly possible to over-emphasize the caution that is needed, and without some attention to such environmental and economic factors as he mentions I believe any comparative analysis is nearly worthless.

His suggestion as to the explanation of the high incidence of gastric illnesses amongst weavers is interesting. I am rather intrigued to see whether the same result will be given in the case of spinners, as I think amongst them there is about the same proportion of married women at work. With regard to the printers I should have liked to divide the night and day workers. In fact I did attempt to separate newspaper workers from general printers, but the method of enquiry made it impossible to do this at all adequately. For one thing, I had my records of sickness direct from

the Approved Societies, and these Societies have no knowledge of the workplaces of their members. But a much greater difficulty is that one class is recruited from the other, and that there is a continual interchange. Newspaper work is highly paid and demands, probably, more skill than general printing, so that, at the outset, there is very likely selection of the more mentally and physically strong. Also when a newspaper worker develops such a disease as phthisis he is perhaps unable to carry on with night work and drifts back into the general printing trade.

I am glad to have Mr. Wood's evidence with regard to the question of over- or under-measurement of sickness. I did not mean to bring forward at all a charge of malingering. The point that mainly interests me is the inexactness resulting from the definition of sickness with which we have to work—absence from work due to incapacity.

In reply to Mr. Walton, every occupation must have peculiarities of its own in sickness incidence, bound up in this definition of sickness. With coal-miners, for instance, there may be a high rate from diseases such as rheumatism. The miner cannot work when he has such a type of illness, while, possibly, a bank clerk can very well do so. In the printing industry the problem is one of a peculiar incidence of phthisis, so, again, these figures would not be applicable to the general insured population. In reply to his second point, I do not think it would be sound to assume that the incidence of sickness amongst the insured population is that of the nation at large, since such factors as environment, economic level, nutritional standards may be appreciably different between the insured and the uninsured.

I think Mr. Flux is right in suggesting some modification of the frequency with which sickness ends on a Saturday, but this, of course, does not alter the peculiar "end of the week" incidence in comparison with that found at the beginning of the week.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

The Rt Hon Lord Ebbisham of Cobham, G.B.E.
Kuo-Pao King.

Corporate Representative.

Horace Alec Haylett, representing Messrs. Saward, Baker & Company.

WHOLESALE PRICES OF COMMODITIES IN 1928

By THE EDITOR OF THE "STATIST"

(The *Statist's* Index Numbers, in continuation of Mr A SAUERBECK'S figures)

THE following table of index numbers compiled to the end of 1912 by Mr Augustus Sauerbeck, and subsequently by the *Statist*, shows the course of wholesale prices of forty five commodities during the last twenty one years as compared with the standard period of eleven years, 1867-77, which in the aggregate is equivalent to the average of the twenty five years 1853-77 (see the *Journal*, 1886, pp 592 and 648, and 1893, pp 220 and 247) There are added corresponding data for 1896, the year of lowest prices, and for 1873, just after the Franco Prussian War

Summary of Index-Numbers Groups of Articles, 1867-77 = 100

	Vegetable Food (Corn etc)	Animal Food (Meat, etc)	Sugar Coffee Tea	Total Food	Minerals	Textiles	Synthetic Materials	Total Materials	(Total)	Wheat Harvest	Average Price of Consols	Average Bank of England Rate
1873	106	109	106	107	141	103	106	114	111	97.4	80	Percent 4.750
1896	53	73	59	62	63	54	63	60	61	50.5	112	2.483
1907	69	88	48	72	107	77	78	86	80	49.6	113	4.925
'08	70	89	48	72	89	82	73	74	73	40.1	108	3.013
'09	71	89	50	73	86	84	76	75	74	38.9	113	3.083
'10	65	96	54	74	89	73	81	81	78	40.5	102	3.725
'11	70	90	61	75	93	78	81	83	80	40.4	110	3.467
1912	78	96	62	81	110	76	82	86	85	46.1	97	3.776
'13	69	90	54	77	111	84	83	91	85	45.3	105	4.771
'14	75	100	58	91	99	81	87	88	85	41.6	109	4.038
'15	108	126	70	170	126	92	109	108	108	38.9	106	5.000
'16	133	152	86	130	158	129	136	140	136	50.4	97	5.470
1917	177	192	113	169	172	192	174	179	175	65.8	102	5.15
'18	168	207	130	174	193	222	202	206	192	76.4	111	5.0
'19	179	213	147	145	220	226	219	222	208	85.3	98	5.166
'20	227	263	198	234	295	262	244	264	261	76.1	96	6.71
'21	143	218	83	156	181	140	145	153	155	48.1	118	6.092
1922	107	164	82	130	142	134	124	132	131	51.6	105	3.692
'23	98	162	101	122	155	140	117	134	129	49.4	105	3.496
'24	119	156	105	130	158	170	120	146	139	50.7	107	4.0
'25	118	162	89	129	154	165	119	143	136	52.5	114	4.575
'26	108	150	88	119	154	133	114	131	126	47.1	99	5.0
1927	108	138	83	114	141	131	118	129	122	42.8	109	4.650
28	107	142	75	114	123	136	117	124	120	44.0	109	4.5
Average												
1904-13	68	91	53	73	95	74	76	81	77	44.1	106	3.733
1890-99	61	80	63	69	71	56	66	64	66	55.8	103	2.958
'78-87	79	95	76	84	73	71	81	76	79	82.1	97	3.264
'18-27	109	90	151	111	128	105	106	112	111	96.0	—	3.692

* Silver 60 84d (see note on p 245) per oz, being the parity of 1 gold to 15½ silver = 100

† Wheat harvest in U K to 1895 29 bushels = 100, from 1896, 30 bushels = 100

‡ Average price of Consols and the average Bank of England rate of discount are actual figures, not index numbers, Consols 3% to 1866, 2½% from 1869, 2½% from April, 1903.

The all-commodities index-number for 1928 (based with a very few exceptions on the average of 52 weekly quotations for each commodity) is 120, showing a fall for the fourth successive year. The figure for 1928 represents the lowest level of prices touched since the year 1915; it indicates a fall of 1·6 per cent. in wholesale prices compared with the average for 1927. It is 41·2 per cent. above the average in 1913, 52·2 per cent. below that for 1920, the year of highest prices, and 96·7 per cent. above that for 1896, the year of lowest prices.

The complete series of annual all-commodities index-numbers is shown below. The table records the Sauerbeck-Statist index-numbers from 1846, *i.e.* from the commencement of the calculations together with Jevons' figures adjusted to Mr. A. Sauerbeck's standard for the years 1809, 1810 and 1818.

The Statist's Annual Index-Numbers (in continuation of Sauerbeck's figures).

Year.	Average No.	Year.	Average No.	Year.	Average No.	Year.	Average No.	Year.	Average No.
1928	120	1910	78	1893	68	1876	95	1850	94
'27	122	1909	74	'92	68	'75	96	'58	91
'26	126	'08	73	'91	72	'74	102	'57	105
'25	136	'07	80	'90	72	'73	111	'56	101
'24	139	'06	77	1889	72	'72	100	'55	101
'23	129	'05	72	'88	70	'71	100	'54	102
'22	131	'04	70	'87	68	'70	96	'53	95
'21	155	'03	69	'86	69	1869	98	'52	78
'20	251	'02	69	'85	72	'68	99	'51	75
1919	206	'01	70	'84	76	'67	100	'50	77
'18	192	'00	75	'83	82	'66	102	1849	74
'17	175	1899	68	'82	84	'65	101	'48	78
'16	136	'98	64	'81	85	'64	105	'47	95
'15	108	'97	62	'80	88	'63	103	'46	89
'14	85	'96	61	1879	83	'62	101	'18	159*
'13	85	'95	62	'78	87	'61	98	'10	171*
'12	85	'94	63	'77	94	'60	99	'09	189*
'11	80								

* Jevons' numbers adjusted.

Sterling prices showed a rising tendency for the first five months of the year, the principal contribution to the upward movement being provided by the food-stuffs group. During January there had been a fall of ·4 per cent., but between February and the end of May prices rose by 4·2 per cent. A downward trend then set in and the all-commodities figure for July at 120·3 was the lowest recorded since December 1915, though only ·3 below that of October 1927. The fall in sterling prices continued till October, when the index-number was 116·8. The year closed at a figure of 117·9, being the

same as that registered for November. The fall in prices over 1928 amounted to 2·9 per cent. The highest monthly index-number was 122·6 at the end of January, the lowest 116·8 at the end of September and October. The range of price fluctuations over the year was approximately 8 per cent., compared with 2·9 per cent. in 1927, the latter being the narrowest range of fluctuations experienced since 1910. The net decline of 2·9 per cent. in the all-commodities monthly index-numbers over 1928 is the result of wider fluctuations in the index-numbers of the individual groups of commodities. On balance there was a fall of ·9 per cent. in food-stuffs, while materials fell by 4·3 per cent. Among materials, minerals declined by 4·8 per cent., textiles by 2·2 per cent., and sundries by 5·4 per cent. In the Food-stuffs group, vegetable foods fell by 3·1 per cent., animal foods rose by 4·0 per cent., and sugar, tea and coffee fell by 9·5 per cent.

A record of fluctuations in the monthly group and final index-numbers since the commencement of 1926 is afforded by the table on page 242.

Some wide fluctuations occurred in the prices of individual commodities over the year 1928. The highest price of English wheat was 11s. 3d. per quarter in the month of May, and the lowest 9s. 1d. per quarter in the first week of October; at the same dates the price of flour (straights) per 280 lb. was 44s. and 35s. 6d. respectively. The price of potatoes at the beginning of the year was 150s. per ton, and at the year end 115s. Meat prices, with the exception of Scotch beef, were higher at the close of the year than at the opening; English beef by 6d. per 8 lb., English mutton by 8d. per 8 lb., and English and Irish pork by 1s. per 8 lb. Sugar prices showed a tendency to decline throughout the year, white Java opening at 14s. 10½d. per cwt. in January, and closing in December at 12s. 1½d. In the minerals section iron and steel prices scarcely varied over the year. The lowest price of standard copper was £61 a ton, and the highest £71 a ton at the end of 1928. Copper prices showed a consistent upward tendency for the last five months of the year. Lead prices showed less violent fluctuations than those for copper, but tin quotations were as usual very variable, falling considerably over the first half of the year, showing a sharp recovery in September and October, followed by an equally sharp decline in December. The quotation for middling American cotton at the end of December was 10·64d. per lb. compared with 10·92d. per lb. at the beginning of January. Cotton prices fell sharply during July and August, remaining fairly stable to November, when a slight increase was registered. Livonian flax prices at the same periods were respectively £96 and £95 per ton; hemp £38 5s. and £42 per ton, and jute

January, 1926—March, 1929.

	Vegetable Food.	Animal Food.	Sugar, Tea, and Coffee.	Food Stuffs.	Minerals.	Textiles.	Sundry Materials.	Miscellaneous.	All Commodities.
1926.									
Jan. ...	106.1	152.3	88.3	119.4	151.7	153.6	114.6	136.6	129.3
Feb. ...	103.6	154.6	87.0	118.8	151.5	146.0	115.3	134.5	127.9
March ...	102.0	150.3	85.1	116.2	147.6	146.8	114.3	133.3	126.1
April ...	104.3	155.1	86.3	119.2	145.1	139.9	113.6	130.2	125.5
May ...	104.3	154.5	89.3	119.5	147.1	138.0	113.8	130.2	125.7
June ...	103.7	155.4	89.5	119.7	151.9	129.3	113.6	128.7	124.9
July ...	106.9	155.0	87.4	120.5	159.1	127.8	113.2	130.0	126.0
Aug. ...	108.2	153.4	87.0	120.4	163.5	128.0	114.7	131.9	127.0
Sept. ...	105.4	154.2	90.2	120.1	175.7	123.4	114.4	133.7	128.0
Oct. ...	110.3	143.6	86.7	117.6	206.8	117.6	115.8	140.9	131.0
Nov. ...	110.1	141.7	89.9	117.5	207.4	114.9	116.5	140.5	130.8
Dec. ...	107.5	147.8	90.1	118.7	161.8	115.0	115.3	127.7	123.9
1927.									
Jan. ...	108.3	143.4	87.2	116.7	156.1	118.3	116.6	127.7	123.1
Feb. ...	108.6	141.7	86.2	115.8	158.0	120.0	119.3	129.9	124.1
March ...	107.5	145.0	82.7	115.8	151.0	123.8	119.1	129.1	123.6
April ...	108.6	148.4	82.9	117.8	144.1	124.5	118.7	127.3	123.3
May ...	113.6	146.2	83.8	119.4	140.3	129.3	117.0	127.0	123.8
June ...	112.6	143.0	81.0	117.1	137.8	130.0	119.0	127.4	123.1
July ...	106.9	138.9	80.4	113.1	136.1	137.0	117.6	128.6	122.0
Aug. ...	109.4	137.7	80.8	113.8	132.7	141.4	118.4	129.3	122.8
Sept. ...	104.4	137.7	81.1	111.7	131.0	140.9	118.2	128.6	121.5
Oct. ...	105.4	125.3	81.4	107.8	132.7	140.4	120.9	130.1	120.6
Nov. ...	103.6	134.4	81.4	110.3	133.5	139.9	119.8	129.8	121.5
Dec. ...	104.5	136.6	83.1	111.8	132.1	135.4	121.1	128.5	121.4
1928.									
Jan. ...	105.6	136.9	80.1	111.8	126.1	135.7	122.8	127.6	120.9
Feb. ...	107.3	144.2	79.4	115.0	121.3	137.7	119.3	125.5	121.1
March ...	113.8	150.2	81.4	120.4	123.4	136.7	119.7	125.9	123.6
April ...	118.5	151.2	80.7	122.6	124.5	139.6	121.2	127.8	125.6
May ...	120.0	157.5	82.4	126.3	124.6	139.6	117.2	126.1	126.2
June ...	114.6	147.3	80.2	119.4	119.6	142.7	115.4	124.9	122.6
July ...	105.6	145.1	78.2	114.4	119.8	140.3	116.3	124.7	120.3
Aug. ...	100.7	140.9	76.1	110.7	120.2	135.7	116.3	123.3	118.0
Sept. ...	96.9	139.9	77.3	108.6	123.1	120.8	117.5	122.8	116.8
Oct. ...	102.1	134.2	77.5	108.7	125.5	130.3	115.4	122.7	116.8
Nov. ...	102.5	138.0	76.1	110.9	126.7	131.9	115.9	123.7	117.9
Dec. ...	101.2	142.1	75.2	108.8	125.7	132.4	114.5	123.0	117.9
1929.									
Jan. ...	102.2	138.4	75.7	109.9	127.0	130.1	113.2	122.1	117.0
Feb. ...	104.6	145.1	75.4	113.4	129.8	131.2	117.7	125.1	120.1
March ...	101.8	144.6	75.2	112.0	133.9	130.9	118.9	126.6	120.5

£33 10s. and £33 per ton. South Australian wool quotations varied between 1s. 6d. and 1s. 3½d. per lb., the latter figure ruling in November, when the downward movement starting in August was checked.

The Sundries group provided substantial changes in prices. Leather (dressing hides) fell from 2s. 5d. per lb. to 1s. 8d. per lb., the latter figure ruling for the last two months of 1928. The average

import price over the year was 12·09*d.* per lb. compared with 9·85*d.* in 1927. Palm oil quotations rose over the year from £35 10*s.* to £39 15*s.* per ton, and linseed oil from £28 to £30 per ton. The average import price of hewn timber in 1928 was £2 5*s.* 10*d.* per load compared with £2 5*s.* 5*d.* per load in 1927, sawn timber showing a greater difference at £5 11*s.* 1*d.* compared with £5 7*s.* 6*d.* in 1927.

The following figures show in each case the average index-number of all the forty-five commodities for ten years (see the dotted line in the diagram of the *Journal*, 1886, and also the *Journal*, 1893, p. 220). These give the best picture of the gradual movement of the average prices of whole periods, as the ordinary fluctuations are still further obliterated.

1818-1827 = 111	1895-1904 = 67	1908-1917 = 98
'28- '37 = 93	'96- '05 = 68	'09- '18 = 110
'38- '47 = 93	'97- '06 = 70	'10- '19 = 123
'48- '57 = 89	'98- '07 = 71	'11- '20 = 146
'58- '67 = 99	'99- '08 = 72	'12- '21 = 148
'68- '77 = 100	1900- '09 = 73	'13- '22 = 153
'78- '87 = 79	'01- '10 = 73	'14- '23 = 157
'88- '97 = 67	'02- '11 = 74	'15- '24 = 162
'00- '99 = 66	'03- '12 = 76	'16- '25 = 165
'91-1900 = 66	'04- '13 = 77	'17- '26 = 164
'02- '01 = 66	'05- '14 = 79	'18- '27 = 159
'93- '02 = 66	'06- '15 = 82	'19- '28 = 152
'94- '03 = 66	'07- '16 = 88	

Closer calculation reveals the decade 1890-99 to have been the lowest on record. Since then the average has advanced from 66 to 152, or by 130·3 per cent. The decade 1916-25 is the highest on record.

In reviewing the trend of sterling prices over 1928 it is necessary to appreciate the monetary and credit policies pursued during the year. Monetary stability was a characteristic of the period and a 4½ per cent. bank rate was maintained throughout. In New York the Federal Reserve Bank's rediscount rate, which was 3½ per cent. at the beginning of the year, was increased to 4 per cent. from February 2, to 4½ per cent. from May 17 and to 5 per cent. from July 12. The official discount rate at Amsterdam stood at 4½ per cent. throughout the year, and in Berne it remained unchanged, as in 1927, at 3½ per cent. The monetary stability experienced in this country last year was the result of conscious policy on the part of the Bank of England. During the first half of 1928 gold accrued steadily to the Bank, partly as a result of the New York rediscount rate being lower than the Bank rate. To prevent this accumulation of gold having its normal effect upon the volume of credit, open market operations were resorted to which approximately offset the result of the gold influx. During the last four months of the year the flow of gold was reversed, and the previous open market operations had to be "undone." Early in 1929 further steps were necessary, and the

Bank rate was raised to curb the efflux of gold. A serious aspect of the tightening of credit in this country, necessitated by the speculative position in New York, which has also caused an increase in the Federal Reserve rediscount rate, is that a strong pull is exerted in the direction of world deflation. High money rates and restricted credit in the two principal gold-using countries of the world make for a steady appreciation in the commodity value of gold, *i.e.* for a further fall in world prices.

The fall of 2.9 per cent. in sterling prices in 1928 conforms with the general trend of gold prices throughout the world. Wholesale prices in the United States, measured by Bradstreet's index-number, fell by 4.5 per cent.; those in Canada, measured by the index-number of the Bureau of Statistics, fell by 3.4 per cent.; those in Switzerland, measured by Dr. Lorenz's index-number, fell by 4.0 per cent.; those in Germany, measured by the *Frankfurter Zeitung's* index-number, fell by .7 per cent., and those in Holland, measured by the index-number of the Bureau of Statistics, fell by 2.0 per cent.

Silver.—In the silver market prices were well maintained in 1928, fluctuations generally being narrow. The range in the quotations

World's Production of Silver (in millions of ounces).

	United States.	Mexico.	Canada.	Australia.	Other Countries.	Total.
1901... ..	55.2	57.6	5.2	10.2	44.8	173.0
'02... ..	55.5	60.2	4.3	8.0	34.8	162.8
'03... ..	54.3	70.5	3.1	9.7	30.1	167.7
'04... ..	57.7	60.8	3.7	14.5	27.5	164.2
'05... ..	56.1	65.0	5.9	15.0	30.3	172.3
'06... ..	56.5	55.2	8.5	14.2	30.6	165.0
'07... ..	56.5	61.0	12.8	19.0	34.8	184.2
'08... ..	52.4	73.6	22.1	17.2	37.8	203.1
'09... ..	54.7	73.9	27.5	16.3	39.7	212.1
'10... ..	57.1	71.4	32.9	21.5	38.8	221.7
'11... ..	60.4	79.0	32.7	16.6	37.5	226.2
'12... ..	63.8	74.6	31.6	18.1	36.2	224.3
'13... ..	66.8	70.7	31.5	3.5	51.4	223.9
'14... ..	72.4	27.5	28.4	3.6	36.5	168.4
'15... ..	74.9	39.5	28.4	4.1	37.3	184.2
'16... ..	74.4	38.2	25.4	4.2	26.6	168.8
'17... ..	71.7	35.0	22.2	10.0	35.3	174.2
'18... ..	67.8	62.5	21.2	10.0	35.9	197.4
'19... ..	56.7	62.7	15.7	7.4	32.0	174.5
'20... ..	55.5	66.8	12.6	7.5	33.0	175.4
'21... ..	53.1	64.5	13.1	4.9	35.7	171.3
'22... ..	56.2	81.1	18.6	11.3	46.3	213.5
'23... ..	73.3	90.9	17.8	10.3	50.2	242.5
'24... ..	65.3	91.5	19.7	10.8	52.2	239.5
'25... ..	66.1	92.9	20.2	11.1	54.8	245.1
'26... ..	62.7	98.3	22.4	11.2	59.0	253.6
'27... ..	60.4	104.6	22.6	7.3	56.2	251.1
'28*... ..	56.0	105.0	22.0	7.0	59.0	249.0

* Provisional.

for cash delivery was only $2\frac{1}{2}d$ per ounce, compared with $3\frac{1}{4}d$ in 1927. The highest cash quotation, $28\frac{3}{4}d$, was recorded in May owing to speculative anticipation that silver might be required for the payment of Japanese troops on the intervention of Japan in China. The lowest cash quotation of the year was $26\frac{1}{2}d$, recorded during January. Comparative statistics of the world's production are appended.

The prices and index numbers are as follows (60 s.d. per standard oz., being parity of 1 gold to 15 $\frac{1}{2}$ silver = 100) —

	Price per oz. standard	Index number		Price per oz. standard	Index number
Average 1873	59 $\frac{1}{2}$	=97.4	London Nov., 1902	21 $\frac{1}{2}$	=35.6
" 1900-99	34	=55.8	London Dec., 1906	32 $\frac{1}{2}$	=53.1
" 1917-26	40 $\frac{1}{2}$	=66.6	" Dec., '08	23 $\frac{1}{2}$	=38.1
" 1893	35 $\frac{1}{2}$	=58.6	" Dec., '11	25 $\frac{1}{2}$	=41.2
" '96	30 $\frac{1}{2}$	=50.5	" Dec., '12	29	=47.7
" 1909	23 $\frac{1}{2}$	=38.9	" Dec., '13	26 $\frac{1}{2}$	=43.7
" '13	27 $\frac{1}{2}$	=45.3	" June, '14	26	=42.7
" '14	25 $\frac{1}{2}$	=41.6	" Dec., '14	22 $\frac{1}{2}$	=37.3
" '15	23 $\frac{1}{2}$	=38.9	" Dec., '15	26 $\frac{1}{2}$	=43.1
" '16	31	=50.4	" Dec., '16	36 $\frac{1}{2}$	=58.7
" '17	40 $\frac{3}{4}$	=65.5	" Dec., '17	43 $\frac{1}{2}$	=70.0
" '18	47 $\frac{1}{2}$	=76.4	" Dec., '18	48 $\frac{1}{2}$	=77.9
" '19	57	=85.3	" Dec., '19	77 $\frac{1}{2}$	=98.3
" '20	61	=78.1	" Dec., '20	40 $\frac{3}{4}$	=49.2
" '21	36 $\frac{7}{8}$	=45.1	" Dec., '21	34 $\frac{3}{8}$	=49.3
" '22	34 $\frac{1}{2}$	=51.6	" Dec., '22	31 $\frac{1}{2}$	=49.6
" '23	31 $\frac{1}{2}$	=40.4	" Dec., '23	33 $\frac{1}{2}$	=49.0
" '24	34	=50.7	" Dec., '24	31 $\frac{1}{2}$	=50.4
" '25	32 $\frac{1}{2}$	=52.5	" Dec., '25	31 $\frac{1}{2}$	=52.1
" '26	28 $\frac{1}{2}$	=47.1	" Dec., '26	25	=41.1
" '27	26 $\frac{1}{2}$	=42.8	" Dec., '27	26 $\frac{1}{2}$	=43.6
" '28	26 $\frac{1}{2}$	=44.0	" Dec., '28	26 $\frac{1}{2}$	=43.3

* All the index numbers in the table from 1916 to 1925 inclusive are calculated on the basis of the gold prices of silver instead of the sterling prices, though the latter are, of course, the actual price quotations given in the table. In arriving at the index numbers the price of gold during 1916, 1917, and 1918 is taken as 86s. 9 $\frac{1}{2}d$ per fine oz., derived from the "pegged" New York rate of \$4.76 $\frac{1}{2}$ to the £. For 1919 the average price of gold is taken as 93s. 4 $\frac{1}{2}d$, this being the parity price with the U.S. dollar the average New York exchange in that year being \$4.429. The index numbers for other dates are based on the quotations in the London market for exportable gold. The average price in 1920 was 112s. 11 $\frac{1}{2}d$ per fine oz., in 1921 107s. 0 $\frac{1}{2}d$, in 1922 93s. 1 $\frac{1}{2}d$, in 1923 90s. 3 $\frac{1}{2}d$, in 1924 93s. 8 $\frac{1}{2}d$, and in 1925 85s. 5 $\frac{1}{2}d$. At the end of 1919 the quotation was 109s. 8 $\frac{1}{2}d$, at the end of 1920 116s. 1 $\frac{1}{2}d$, at the end of 1921 98s. 0 $\frac{1}{2}d$, at the end of 1922 98s. 11 $\frac{1}{2}d$, at the end of 1923 95s. 4 $\frac{1}{2}d$, and at the end of 1924 86s. 2 $\frac{1}{2}d$.

Gold.—The following table shows the world's annual gold production since 1850. Prior to 1911 the estimates are those of the Bureau of the U.S. Mint and other authorities. For years after 1911 the *Statist's* estimates are given. The value is taken throughout at £4.25 per fine oz. The estimate for 1928 is subject to revision.

(000's omitted.)

Year.	Value of output. £	Year.	Value of output. £
1850	11,600	1890	24,421
'51	17,200	'91	26,846
'52	26,550	'92	30,134
'53	31,090	'93	32,363
'54	25,490	'94	37,220
'55	27,015	'95	40,843
'56	29,520	'96	41,559
'57	26,655	'97	48,509
'58	24,930	'98	58,949
'59	24,970	'99	63,027
'60	23,850	1900	52,312
'61	22,760	'01	53,630
'62	21,550	'02	60,975
'63	21,390	'03	67,337
'64	22,600	'04	71,380
'65	24,040	'05	78,143
'66	24,220	'06	82,707
'67	22,805	'07	84,857
'68	21,945	'08	90,995
'69	21,245	'09	93,302
'70	21,370	'10	93,544
'71	25,400	'11	94,930
'72	24,200	'12	95,783
'73	23,600	'13	97,481
'74	22,950	'14	92,709
'75	22,700	'15	97,114
'76	22,540	'16	92,597
'77	23,830	'17	87,236
'78	22,020	'18	78,605
'79	21,400	'19	73,078
'80	22,130	'20	68,522
'81	21,150	'21	67,848
'82	20,500	'22	66,723
'83	20,640	'23	77,888
'84	20,830	'24	81,807
'85	21,250	'25	82,267
'86	21,430	'26	82,211
'87	21,735	'27	82,442
'88	22,644	'28	83,874
'89	25,375		

The monthly (end of month) all-commodities index-numbers since 1885, together with quarterly averages for the group and final index-numbers since 1915 inclusive, are shown in the following pages.

Monthly Fluctuations of the Index-Numbers* of 45 Commodities, 1887-77 = 100.

	Jan.	Feb.	March	April.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1885	72.3	72.6	72.5	72.5	73.3	72.7	72.2	72.2	71.1	70.4	71.1	70.8	72
'86	70.0	70.5	70.1	69.2	69.1	68.7	68.8	69.1	68.9	68.8	69.8	69.5	69
'87	69.5	68.5	68.3	68.4	68.2	67.9	68.1	68.3	68.2	67.7	69.1	72.4	68
'88	70.9	70.6	69.9	69.8	68.1	67.4	69.0	70.1	71.9	72.4	72.7	73.2	70
1889	72.6	73.5	72.1	72.0	71.4	71.6	72.6	71.4	72.1	72.1	73.7	73.7	72
'90	73.2	72.7	71.5	71.2	70.8	70.5	71.2	72.8	72.2	72.9	71.2	71.1	72
'91	71.1	71.5	71.7	72.4	72.8	71.8	71.6	71.9	71.7	70.7	71.4	71.4	72
'92	70.0	70.0	69.1	68.9	68.8	67.7	67.8	67.4	66.8	67.4	68.2	67.7	68
'93	68.4	69.0	68.1	67.4	67.4	67.4	67.7	67.1	68.2	68.6	67.8	67.0	68
1894	65.8	65.0	64.3	63.8	63.1	63.1	62.6	63.0	62.7	61.7	60.8	60.1	63
'95	60.0	60.0	60.8	61.7	62.5	62.4	62.8	63.3	63.5	63.3	62.3	61.2	62
'96	61.4	61.4	60.7	60.3	60.1	59.3	59.2	59.7	61.2	62.6	62.6	62.0	61
'97	62.0	61.9	61.9	61.5	61.2	61.3	61.7	63.2	63.4	62.7	62.4	62.4	62
'98	62.8	63.4	63.0	65.3	66.4	64.7	64.3	64.0	63.9	63.6	63.9	63.8	64
1899	65.4	65.8	65.6	66.1	66.6	66.9	67.9	68.3	70.0	71.5	71.6	72.3	68
1900	74.0	75.1	75.7	75.6	75.3	75.7	76.2	76.0	75.5	74.7	73.9	73.4	75
'01	72.2	71.7	71.0	70.6	70.5	69.8	69.5	69.8	69.6	69.6	69.0	68.4	70
'02	68.8	68.9	69.2	69.7	70.9	70.4	70.0	69.5	69.3	68.8	68.6	69.1	69
'03	69.5	70.2	70.4	69.4	69.6	69.5	69.5	70.0	69.1	69.0	69.0	70.0	69
1904	70.4	70.8	70.8	70.5	69.9	69.4	69.9	70.4	70.7	71.0	71.2	70.9	70
'05	71.2	71.4	71.8	72.0	71.7	72.0	72.5	72.3	72.4	73.2	74.2	74.9	72
'06	75.2	75.0	75.7	76.5	77.0	76.9	76.4	76.7	77.5	78.5	78.6	79.7	77
'07	80.0	80.7	80.0	80.7	82.4	82.0	81.1	79.4	79.1	78.8	76.7	76.2	80
'08	76.0	74.5	74.1	73.8	73.6	72.9	73.1	72.2	72.5	72.2	72.2	72.3	73
1909	72.0	71.9	72.4	74.3	75.4	75.1	75.2	74.9	74.7	75.2	75.5	76.3	74
'10	77.1	78.1	79.1	78.5	78.2	76.9	78.1	78.2	77.6	77.2	77.8	77.9	78
'11	78.5	78.6	78.9	80.0	80.3	80.0	78.9	79.5	80.3	80.7	80.6	80.9	80
'12	81.8	82.9	84.4	85.0	85.3	85.5	86.5	85.9	86.7	85.8	85.3	86.4	85
'13	86.4	86.4	86.7	86.2	85.7	84.1	84.2	85.0	85.7	84.5	83.3	83.8	85
1914	83.5	83.8	82.8	82.3	82.3	81.2	82.4	87.9	89.3	89.8	88.8	91.6	85
'15	96.4	100.9	103.7	105.9	107.2	106.4	106.4	107.0	107.8	110.0	113.1	118.4	108
'16	123.6	127.0	130.4	134.2	135.4	131.0	130.5	134.5	134.4	141.5	150.8	154.3	136
'17	159.3	164.0	169.0	173.0	175.0	180.4	176.9	175.7	176.4	180.6	182.9	185.1	175
'18	186.2	187.3	188.0	189.8	191.1	192.3	192.9	195.9	197.1	197.8	195.3	196.0	192
1919	190.1	187.7	184.7	184.6	194.6	199.4	206.4	212.7	214.8	224.3	231.0	235.2	206
'20	245.3	260.4	261.8	260.1	260.0	255.7	254.6	253.5	248.7	239.9	223.8	207.2	251
'21	197.2	183.0	177.2	169.8	162.2	155.8	158.2	154.3	149.4	138.4	136.7	133.6	155
'22	132.5	132.2	133.3	134.8	135.5	135.6	134.0	129.6	127.9	130.1	130.6	129.1	131
'23	130.2	131.9	132.7	134.0	132.2	127.9	124.8	125.0	127.8	127.7	132.4	133.2	129
1924	137.2	138.8	137.0	136.8	136.4	136.3	138.4	138.0	141.6	146.1	145.5	147.7	139
'25	144.8	143.1	140.1	137.5	135.7	131.2	134.3	134.3	132.7	130.2	132.9	130.4	136
'26	129.3	127.9	126.1	125.5	125.7	124.9	126.0	127.0	128.0	131.0	130.8	123.9	126
'27	123.1	124.1	123.6	123.3	123.8	123.1	122.0	122.8	121.5	120.6	121.5	121.4	122
'28	120.9	121.1	123.6	125.6	126.2	122.6	120.3	118.0	116.8	116.8	117.9	117.9	120
'29	117.0	120.1	120.5										

* The average of the twelve monthly figures of each year does not necessarily coincide with the annual figures, as the latter are calculated mostly from the average of 52 weekly quotations, while the former are based on end-of-the-month prices.

Quarterly Movements of Prices.*

Summary of Index-Numbers, 1867-77 = 100.

Years.	Quar- ters.	Veg- table Food (Corn, etc.).	Animal Food (Meat, etc.).	Sugar, Coffee, and Tea.	Total Food.	Mine- rals.	Tex- tiles.	Sundry Mate- rials.	Total Mate- rials.	Grand Total.	Sil- ver.†
1917	I	181.2	182.5	100.6	164.7	163.3	166.6	161.5	163.6	164.1	59.5
	II	188.8	197.8	107.0	174.9	169.0	184.4	176.8	177.1	177.3	61.1
	III	168.2	194.3	114.9	166.6	168.6	201.3	179.9	183.4	176.3	72.1
	IV	161.7	192.6	133.1	167.1	172.6	215.6	192.8	194.3	182.8	70.3
'18	I	168.2	199.6	136.2	173.0	177.9	223.2	191.3	197.5	187.1	70.2
	II	167.6	201.9	123.7	171.0	182.4	223.1	207.9	205.7	191.0	77.8
	III	174.9	206.6	123.9	175.8	191.8	228.2	207.3	209.5	195.3	79.1
	IV	177.6	229.6	126.1	185.8	184.2	218.8	205.8	204.0	196.3	78.8
'19	I	171.2	216.6	121.6	177.4	173.1	202.5	201.2	194.0	188.1	77.3
	II	169.9	206.4	126.5	175.3	189.0	210.5	214.1	206.5	192.8	81.1
	III	178.0	207.1	165.5	183.7	226.1	228.9	234.9	230.7	211.3	84.2
	IV	184.3	226.6	177.6	198.2	251.5	270.1	242.6	253.4	230.1	95.7
'20	I	211.4	234.0	207.9	219.0	289.8	298.2	267.0	282.7	255.7	96.7
	II	244.5	250.1	243.0	246.3	296.3	271.8	254.5	271.1	260.6	79.2
	III	226.7	287.2	207.6	245.0	309.4	247.3	232.2	257.7	252.3	71.5
	IV	208.2	280.4	126.4	217.7	293.0	190.0	214.2	227.7	223.6	57.6
'21	I	151.4	270.6	100.1	184.5	222.6	153.5	187.9	186.7	185.8	46.8
	II	150.3	225.2	89.2	164.8	187.9	140.1	169.0	160.9	162.6	45.5
	III	149.8	202.5	81.4	155.3	174.3	142.7	147.6	153.4	154.0	48.0
	IV	118.3	166.9	78.3	127.8	149.6	150.0	132.3	142.4	136.2	52.4
'22	I	114.0	177.0	75.9	129.2	132.2	142.4	131.8	135.2	132.7	49.7
	II	116.0	199.5	80.3	139.2	134.7	136.0	128.3	132.4	135.3	52.9
	III	102.4	182.8	82.8	127.9	138.3	139.7	123.3	132.2	130.5	53.2
	IV	98.7	176.0	87.6	124.9	141.1	145.1	120.7	133.7	129.9	50.3
'23	I	94.0	175.3	100.6	125.3	154.4	139.4	122.2	136.2	131.6	50.1
	II	96.1	164.0	110.2	124.0	156.6	141.9	120.3	136.6	131.4	50.5
	III	100.3	157.7	96.2	120.6	149.0	134.8	113.9	129.7	125.9	48.2
	IV	101.1	152.0	105.1	120.7	158.9	153.5	115.0	138.7	131.1	48.8
'24	I	115.1	146.2	111.5	126.6	169.0	159.6	121.0	145.9	137.7	48.8
	II	118.3	155.3	97.2	127.5	156.7	165.2	118.4	143.1	136.5	49.9
	III	121.8	159.7	99.7	131.1	157.1	173.1	117.3	145.2	139.2	51.6
	IV	134.5	160.0	108.3	138.4	163.9	182.7	122.5	152.2	146.4	52.4
'25	I	129.0	165.6	98.8	136.1	157.0	171.6	123.9	147.5	142.7	51.6
	II	116.6	164.8	86.7	128.1	150.5	157.8	119.8	139.7	134.8	51.5
	III	112.6	163.3	83.5	125.2	153.9	159.2	117.3	140.1	133.8	53.3
	IV	108.9	135.1	82.6	120.4	153.7	159.8	114.5	139.0	131.2	53.1
'26	I	103.9	132.4	86.8	118.1	150.3	148.8	147.7	134.8	127.8	50.6
	II	104.1	155.0	88.4	119.5	148.0	135.7	113.7	129.7	125.4	49.3
	III	106.8	154.2	88.2	120.3	166.1	126.4	114.1	131.9	127.0	47.4
	IV	109.3	144.4	88.9	117.9	192.0	115.8	115.9	136.4	128.6	41.2
'27	I	108.1	143.4	85.4	116.1	155.0	120.7	118.3	128.9	123.6	43.0
	II	111.6	145.9	82.6	118.1	140.7	127.9	118.2	127.2	123.4	43.0
	III	106.9	138.1	80.8	112.9	133.3	139.8	118.1	128.8	122.1	42.1
	IV	104.5	132.1	82.0	110.0	132.8	138.6	120.6	129.5	121.2	43.3
'28	I	108.9	143.8	80.3	115.7	123.6	136.7	120.6	126.3	121.9	43.2
	II	118.0	152.0	81.1	122.8	122.9	140.6	117.9	126.3	124.8	44.7
	III	101.1	142.0	77.9	111.2	121.0	135.3	116.7	123.6	118.4	44.3
	IV	101.9	138.1	76.3	109.8	126.0	131.5	115.3	123.5	117.5	43.7

* The averages of the four quarterly figures to each year do not necessarily coincide with the annual averages, as the latter are based as far as possible on average weekly prices. See also the *Journal*, 1893, p. 221; 1895, p. 144; 1901, p. 90; and 1909, p. 70.

† Silver 60-84d. per oz., being the parity of 1 gold to 15½ silver, = 100.

Construction of the Tabular Statements.

The index-numbers here given are based on the average prices for the eleven years 1867-77. Take, for instance, the *Gazette* price of English wheat :—

	s.	d.	
Average, 1867-77...	54	6	= 100, average point.
„ 1914 ...	35	0	= 64, or 36 per cent. <i>below</i> the average point
„ 1920 ...	80	7	= 143, „ 48 „ <i>above</i> „ „
„ 1926 ...	53	3	= 98, „ 2 „ <i>below</i> „ „

The individual index-numbers, therefore, represent simple percentages of the average point.

The articles are grouped in six categories :—

		1867-77. Total Numbers.	Example for 1928.	
			Total Numbers.	Average.
1. Vegetable food, corn, etc. (wheat flour, barley, oats, maize, potatoes, and rice) ...	8 Index-nos.	800	854	107
2. Animal food (beef, mutton, pork, bacon, and butter) ...	7 „	700	996	142
3. Sugar, coffee, and tea ...	4 „	400	314	78
1—3. <i>Food</i> ...	19 „	1,900	2,164	114
4. Minerals (iron, copper, tin, lead, and coal) ...	7 „	700	860	123
5. Textiles (cotton, flax, hemp, jute, wool, and silk) ...	8 „	800	1,086	136
6. Sundry materials (hides, leather, tallow, oils, soda, nitrate, indigo, and timber) ...	11 „	1,100	1,286	117
4—6. <i>Materials</i> ...	26 „	2,600	3,232	124
<i>General average</i> ...	45 „	4,500	5,396	120

The general average is drawn from all forty-five descriptions, which are treated as of equal value, and is the simple arithmetical mean as shown above.

Average Prices of Commodities.*

No. of Article	0	1	2	3	4	5	6	7	8	1-8	9	10
		Wheat.		Flour.	Barley.	Oats.	Maize ‡	Pota- toes.	Rice.	Vega- table Food.	Beef. †	
Year.	silver † d. per oz.	English Gazette. s. and d. per qr.	Ameri- can. s. and d. per qr.	Town Made whittr (now "G.R."). s. per cwt. (260 lbs.)	English Gazette s. and d. per qr.	English Gazette s. and d. per qr.	Ameri- can Mixed s. per qr.	Good English. s. per ton.	Rangoon Cugoes to Arrive s. and d. per cwt.	Total	Prime. d. per 8 lbs.	Mid- dling. d. per 8 lbs.
1873 ...	59½	58-8	63	51	40-5	25-5	30	160	9-6	—	65	56
'96 ...	30½	26-2	29	25	22-11	14-9	15	55	6-2	—	45	34
1911 ...	24½	31-8	35	29	27-3	18-10	25½	87	8-2	—	51	45
'12 ...	28½	34-9	38	32	30-8	21-6	27½	86	10-1	—	56	49
'13 ...	27½	31-9	36-5	30½	27-3	19-1	23½	78	8-2	—	54	49
'14 ...	25½	35-0	40-1	33½	27-2	21-0	29½	71½	9-1	—	56½	52½
'15 ...	23½	53-11	59-10	49	37-4	30-9	41½	93½	13-3	—	72½	67½
'16 ...	31½	58-5	67-7	52½	51-7	33-5	52½	153½	16-10	—	81½	76½
'17 ...	40½	75-9	83-3	58½	64-10	51-7	71½	186½	25-3	—	104½	101
'18 ...	47½	72-9	78-7	46½	59-0	49-3	78½	142½	26-2	—	103	103
'19 ...	57	72-10	74-10	46½	75-8	52-3	78½	198½	25-10	—	108	108
'20 ...	61½	80-7	92-4	66	90	57-4	90½	242½	41-10	—	125	125
'21 ...	36½	72-9	73-9	64½	54-4	34-5	38½	198	18-5	—	115	109½
'22 ...	34½	47-10	52-11	45½	40-1	29-1	31½	130	14-10	—	88½	82
'23 ...	31½	42-2	47-3	39½	33-8	26-8	36	101	14-10	—	79½	74½
'24 ...	34	49-3	53-9	43½	46-9	27-2	39½	186	16-9	—	82½	76½
'25 ...	32½	52-2	62-4	50½	42-0	27-2	38½	154	16-0	—	80	73½
'26 ...	28½	53-3	58-9	49½	36-11	25-1	29½	127	16-3	—	74	67
'27 ...	26½	49-3	58-3	44½	42-0	25-4	30½	136	15-11	—	70	62
'28 ...	26½	44-8	50-10	40½	39-0	29-0	28½	133	15-0	—	74	66½
Average												
1904-13	26½	31½	36	30	25½	18½	24½	78	7½	—	51	44½
1890-99	34	28½	31½	27½	25½	17½	19½	72	6½	—	47	37½
'78-87	50	40	43½	34½	31½	21	25	102	8	—	55½	46
'67-77	58½	54½	56	46	39	26	32½	117	10	—	59	50

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1873 ...	97-4	108	113	104	104	98	92	137	95	851	110	112
'96 ...	50-4	48	52	54	59	57	46	47	62	425	76	68
1911 ...	40-4	58	63	63	70	72	78	74	82	560	87	90
'12 ...	46-1	64	68	70	79	83	85	74	101	624	95	98
'13 ...	43-3	58	65	66	70	73	73	67	82	554	92	98
'14 ...	41-6	64	72	73	70	81	90	61	91	602	96	105
'15 ...	33-9	99	107	106	96	118	128	80	132	866	122	136
'16 ...	50-4	107	121	114	132	128	163	131	168	1,064	138	154
'17 ...	65-8	139	149	127	166	199	221	160	252	1,413	177	202
'18 ...	76-4	134	140	102	151	190	241	122	262	1,342	174	207
'19 ...	85-3	134	134	102	194	201	242	170	258	1,435	183	216
'20 ...	76-1	148	165	143	231	221	279	207	418	1,812	212	250
'21 ...	48-1	133	132	140	139	132	118	169	184	1,147	195	220
'22 ...	51-6	88	95	100	103	112	96	111	148	853	150	164
'23 ...	49-4	77	84	86	86	103	111	86	148	781	134	149
'24 ...	50-7	90	96	95	120	105	122	159	167	954	139	152
'25 ...	52-5	96	111	109	108	105	119	132	160	940	136	147
'26 ...	47-1	98	105	107	95	96	92	109	163	865	125	134
'27 ...	42-8	90	104	98	108	97	95	116	159	867	119	124
'28 ...	44-0	82	91	87	100	112	118	114	150	854	125	133

* The annual prices are the average monthly or weekly quotations, except potatoes, which are the average weekly quotations during the eight months January to April and September to December.

† Not included in the general average.

‡ Meat (9-13), by the carcase, in the London Central Meat Market.

§ La Plata from 1924.

Average Prices of Commodities—Contd.

No. of Article	11	12	13	14	15	9-15	16A	16B	17	18A	18B	18
	Mutton		Pork	Lamb	Butter		Sugar			Coffee		
Year.	Prime	Mid-ling.	Large and Small, average	Water-ford	Lines-lime to Lime-st	Annual food Total	British West India Refining	Leet, German 88 p.c f o b.	Java, Ceylon, Cargoes	Plantation, Low Mid-ling	Rio, Good.	Mean of 18A and 18B.
	d per 5 lbs.	d per 5 lbs.	d per 5 lbs.	s per cwt	s per cwt		s per cwt	s. per cwt.	s per cwt.	s per cwt.	s per cwt.	
1873 ...	71	63	54	81	123	—	22½	25	28	100	86	—
'96 ...	53	39	35	50	98	—	10½	10½	12½	95	58	—
1911 ...	55	49	46	56	121	—	11½	13	14	53	58	—
'12 ...	59	54	50	69	123	—	11	12½	13½	87	66	—
'13 ...	62	56	55	77	119	—	9½	9½	10½	81	53	—
'14 ...	64	57½	49	75½	120	—	11½	12½	13½	79	45	—
'15 ...	75½	69½	72	93½	141	—	14½	17½	18½	78½	43½	—
'16 ...	93½	86½	87½	109½	191	—	24½	22½	26½	77½	50	—
'17 ...	114½	109½	110½	148	216	—	31½	25½	32½	94½	58	—
'18 ...	109	109	128	183	247	—	33	26½	35½	128½	69	—
'19 ...	114	114	128	190	252	—	38	34½	43½	145½	114½	—
'20 ...	144½	144½	168½	239½	301	—	58	65½	74½	148	111½	—
'21 ...	130½	125½	121½	179	250	—	19½	18½	22	120½	63	—
'22 ...	125	121½	101	145½	202½	—	15	14½	15	120½	74½	—
'23 ...	114½	107	89	113	186	—	25½	23½	24½	117½	55	—
'24 ...	111½	103½	70	106	211	—	23½	20½	21½	152½	85½	—
'25 ...	106½	96½	84½	128½	206½	—	16½	11	12½	153½	98½	—
'26 ...	89	80½	98½	130	173	—	16½	11½	12½	154½	89½	—
'27 ...	86	79½	85	102½	178	—	16½	12½	13½	143½	71½	—
'28 ...	92½	87	77	101½	165½	—	13½	10½	11½	143½	81½	—
Average												
1904-13	58½	51½	47½	67	113	—	10½	10½	12	75½	43½	—
1890-99	54½	41½	42½	59	100	—	11½	11½	13½	98	62	—
'78-87	64½	53	49	71	116	—	17	18	21½	78	52	—
'67-77	63	55	52	74	125	—	23	24	28½	87	64	—

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100

									*	*	
1873 ...	113	114	104	109	98	760	101	98	115	134	125
'96 ...	84	71	67	68	76	512	46	44	109	91	100
1911 ...	87	89	88	89	97	627	52	49	95	91	93
'12 ...	94	98	96	93	98	672	49	47	100	103	102
'13 ...	99	102	105	104	95	695	40	38	93	83	88
'14 ...	102	105	94	102	96	700	50	48	91	70	81
'15 ...	119	127	138	126	113	881	67	66	90	68	79
'16 ...	148	157	169	148	153	1,067	100	93	90	78	84
'17 ...	182	199	212	200	173	1,345	121	115	109	91	100
'18 ...	174	199	248	247	198	1,447	127	125	148	110	129
'19 ...	181	207	246	258	202	1,493	155	153	167	180	174
'20 ...	230	263	324	324	241	1,844	263	262	170	174	172
'21 ...	208	228	234	242	200	1,527	81	77	140	98	119
'22 ...	199	221	194	196	182	1,286	62	54	140	116	128
'23 ...	182	196	171	154	149	1,135	104	87	135	86	111
'24 ...	177	188	135	143	169	1,103	93	75	175	133	154
'25 ...	169	180	162	174	165	1,133	60	43	176	154	165
'26 ...	141	146	190	176	138	1,050	60	44	178	139	159
'27 ...	136	145	163	138	142	967	62	47	165	112	139
'28 ...	146	158	148	137	149	996	51	40	165	127	146

* Index-numbers not included in general average.

† East India good middling from 1908

§ Raw Centrifugals, 96 per cent Pol., from 1924.

‡ Comparative values.

|| White Javas, C I F., from 1924.

Average Prices of Commodities—Contd.

No. of Article.	Year.	191*	190*	198*	19	16-19	1-19	20	20B	21
		Tea.				Sugar, Coffee, and Tea.	Food. Total.	Iron.		
		Concon, Com- mon.	Indian, Cool Medium.	Average Import Price.	Mean of 191 and 19B.	Total.		Scottish Pig.	Cleveland (Mid- dles- brough) Pig.	Pigs, Com- mon.
		d. per lb.	d. per lb.	d. and dec. per lb.				d. and dec. per ton.	d. and dec. per ton.	£ per ton.
1873 ...	12	—	—	16.67	—	—	—	117.3	—	12½
'96 ...	4	7½	—	9.55	—	—	—	46.10	38.2	5
1911 ...	5½	8½	—	9.00	—	—	—	53.5	47.3	6½
'12 ...	5½	8½	—	8.78	—	—	—	64.2	58.2	7½
'13 ...	5	8½	—	9.06	—	—	—	65.6	58.3	7½
'14 ...	6	8½	—	9.19	—	—	—	57.1	51.0	7
'15 ...	8½	10½	—	11.01	—	—	—	71.2	65.2	10½
'16 ...	8	10½	—	11.29	—	—	—	90.0	84.0	13½
'17 ...	16½	15½	—	14.68†	—	—	—	95.7	89.7	13½
'18 ...	20½	16	—	15.0	—	—	—	101.0	95.0	14
'19 ...	13½	15	—	15.5	—	—	—	143.1	137.1	19½
'20 ...	11½†	9½	—	14.97	—	—	—	214.11	208.11	28½
'21 ...	4½	7	—	12.4	—	—	—	168.6	137.4	19½
'22 ...	8½	13½	—	14.9	—	—	—	99.10	90.7	11½
'23 ...	11	17½	—	17.58	—	—	—	108.0	108.9	11½
'24 ...	9½	17½	—	19.0	—	—	—	96.8	88.2	12½
'25 ...	7½	14½	—	19.34	—	—	—	83.4	72.8	11½
'26 ...	7½	16½	—	18.82	—	—	—	87.2	87.6	11½
'27 ...	6½	14½	—	18.58	—	—	—	80.5	73.0	11½
'28 ...	6½	12½	—	16.84	—	—	—	69.9	65.9	9½
Average										
1904-13	7½	7½	—	8½	—	—	—	57½	51½	6½
1890-99	4½	7½	—	9½	—	—	—	47	41½	5½
'78-87	6½	—	—	12½	—	—	—	46	38	5½
'67-77	11½	—	—	17½	—	—	—	69	60	8½
Index-Numbers (or Percentages) of Prices, the Average of 1873-1928										
		*	*							
1873 ...	107	—	97	102	426	2,037	170	—	—	152
'96 ...	36	—	56	46	236	1,173	68	—	—	61
1911 ...	47	—	52	50	244	1,431	78	—	—	77
'12 ...	48	—	51	50	248	1,544	95	—	—	80
'13 ...	44	—	52	48	214	1,463	96	—	—	94
'14 ...	53	—	53	53	232	1,534	84	—	—	85
'15 ...	74	—	64	69	281	2,028	106	—	—	128
'16 ...	71	—	65	68	345	2,476	135	—	—	166
'17 ...	150	—	85	117	453	3,211	144	—	—	166
'18 ...	186	—	87	137	518	3,307	152	—	—	170
'19 ...	120	—	90	105	587	3,515	217	—	—	234
'20 ...	100	—	88	94	791	4,447	329	—	—	343
'21 ...	39	—	72	55	332	3,006	237	—	—	232
'22 ...	77	—	86	82	326	2,465	148	—	—	136
'23 ...	98	—	102	100	402	2,318	168	—	—	144
'24 ...	82	—	110	96	418	2,475	143	—	—	152
'25 ...	70	—	106	88	356	2,429	121	—	—	144
'26 ...	69	—	109	89	352	2,267	135	—	—	139
'27 ...	60	—	108	84	332	2,166	119	—	—	136
'28 ...	56	—	98	77	314	2,164	105	—	—	120

* Index-numbers not included in the general average.

† Approximate.

Average Prices of Commodities—Contd.

23 — Copper		23 Tm	No of Article	24 Lead	25A Walsend Pig Iron in London	25B Walsend Pig Iron in London	26 Average Import Price	20-26 Miner- als Total	27 Cotton, Midd- ling Ameri- can	28 Cotton, Low- land Brazil	29A Petro- gram No. 1	29B Russian Average Import Price	30A Manila Rope	30B Petro- gram No. 2	31 Good Me- dium
Standard £ per ton	High £ per ton	£ per ton	Year	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton
84	92	132	1873 ..	23 1/2	32	—	20 90	—	9	6 1/2	47 1/2	44	43	36	18
47	50	80	'96 ..	11 1/2	15 1/2	8	8 85	—	4	3 1/2	26 1/2	27	17 1/2	25	12 1/2
56	60	191	1911 ...	14 1/2	17 1/2	10 1/2	11 43	—	7 6 1/2	6	37	43 1/2	20	33	20 1/2
73	78	210	'12 ...	18 1/2	21 1/2	14 1/2	12 70	—	6 45	5 1/2	36 1/2	40 1/2	26	37	21
65	73 1/2	201	'13 ...	19 1/2	21 1/2	15 1/2	13 94	—	7 01	5 1/2	34	41 1/2	31 1/2	38	26 1/2
59 1/2	64 1/2	161	'14 ...	19 1/2	21 1/2	14 1/2	13 65	—	6 41	4 1/2	33	38	26 1/2	43	27 1/2
72 1/2	82 1/2	164	'15 ...	24	30 1/2	21 1/2	16 96	—	5 57	4 1/2	59 1/2	66 1/2	41 1/2	60 1/2	21 1/2
115 1/2	134	182	'16 ...	32 1/2	27 1/2	41 1/2	24 64	—	9 00	7	76 1/2	85 1/2	54 1/2	71	31
124 1/2	136 1/2	238	'17 ...	32 1/2	27 1/2	30	27 16	—	16 55	13	113 1/2	151 1/2	84 1/2	105 1/2	39 1/2
115 1/2	126	331	'18 ...	32 1/2	33 6	33 1/2	30 6	—	22 3	17 1/2	120 1/2	156 1/2	99 1/2	166 1/2	39 1/2
92	99 1/2	257	'19 ...	29 1/2	45 3	45 1/2	46 2	—	19 65	14 1/2	120 1/2	174 1/2	58 1/2	147 1/2	50 1/2
97 1/2	112 1/2	302	'20 ...	40	32	51 1/2	79 8	—	23 14	13 1/2	120 1/2	345 1/2	65 1/2	145 1/2	44 1/2
69 1/2	72 1/2	171	'21 ...	24 1/2	32 1/2	29	34 53	—	9 4	5 1/2	112 1/2	118 1/2	40 1/2	145 1/2	27 1/2
63 1/2	66 1/2	162	'22 ...	25 1/2	34 1/2	24 1/2	24 16	—	12 10	8	95	84 1/2	33 1/2	57 1/2	30 1/2
65 1/2	69 1/2	206	'23 ...	28 1/2	32 1/2	28	25 13	—	15 25	10	83 1/2	84 1/2	33 1/2	57	26
63 1/2	67 1/2	251	'24 ...	35 1/2	27 1/2	22	23 38	—	16 26	11 03	120	104 1/2	44	81	31 1/2
61 1/2	65 1/2	267	'25 ...	37 1/2	29 1/2	16 1/2	20 08	—	12 64	11 01	92 1/2	120 1/2	46 1/2	89 1/2	49 1/2
58 1/2	63 1/2	297 1/2	'26 ...	32 1/2	**30 1/2	**16 1/2	18 59	—	9 40	7 75	65	72 1/2	43	74 1/2	43 1/2
55 1/2	60 1/2	303 1/2	'27 ...	25 1/2	23 1/2	14 1/2	17 80	—	9 54	8 27	95 1/2	74 1/2	43	66 1/2	32 1/2
63 1/2	66 1/2	229 1/2	'28 ...	22 1/2	21 1/2	13 1/2	15 67	—	10 92	6 66	98 1/2	91 1/2	37 1/2	63 1/2	33 1/2
67 1/2	72	164 1/2	Average 1904-13	15 1/2	18 1/2	11 1/2	11 1/2	—	6 1/2	5	32 1/2	36 1/2	30 1/2	31 1/2	18 1/2
50	53	81	1890-99	12	17 1/2	10 1/2	10 1/2	—	4 1/2	3	27	27 1/2	26 1/2	25	12 1/2
55	60	89	'78-87	14	16 1/2	8 1/2	9	—	6	4 1/2	33	34	35 1/2	26 1/2	15
75	81	105	'67-77	20 1/2	22	12 1/2	12 1/2	—	9	6 1/2	46	48	43	35	19

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100

1867-77 being 100		1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...	1873 ...
112	—	126	'96 ..	56	68	—	71	444	48	46	56	55	64	107	111
63	—	87	1911 ...	70	61	—	91	654	78	89	86	88	107	111	111
75	—	162	'12 ...	69	90	—	102	771	72	79	82	81	111	111	111
97	—	200	'13 ...	93	96	—	112	775	78	84	80	89	140	143	143
91	—	101	'14 ...	95	97	—	109	693	71	67	76	80	143	143	143
79	—	144	'15 ...	117	140	—	136	880	65	64	134	130	111	111	111
97	—	150	'16 ...	169	125	—	197	1,109	100	104	172	161	163	163	163
154	—	178	'17 ...	158	125	—	217	1,203	153	201	232	243	207	207	207
166	—	227	'18 ...	168	163	—	245	1,347	248	253	294	341	207	207	207
154	—	316	'19 ...	143	206	—	370	1,538	218	219	313	264	264	264	264
123	—	246	'20 ...	195	145	—	638	2,068	257	203	495	270	236	236	236
130	—	288	'21 ...	118	147	—	279	1,268	104	86	246	237	145	145	145
92	—	160	'22 ...	123	156	—	193	994	134	118	191	116	162	162	162
84	—	154	'23 ...	139	147	—	201	1,083	169	148	179	116	137	137	137
88	—	180	'24 ...	175	125	—	187	1,105	181	163	239	160	167	167	167
84	—	230	'25 ...	183	135	—	161	1,080	140	163	227	174	261	261	261
82	—	254	'26 ...	157	138	—	149	1,078	104	115	147	151	231	231	231
77	—	283	'27 ...	125	105	—	142	990	106	123	181	141	172	172	172
74	—	289	'28 ...	109	97	—	125	860	121	128	203	130	178	178	178

* Approximate prices.

† Approximate.

‡ Nominal

§ Best Yorkshire house after 1916

|| Now No 1 Oomra, Fine.

¶ Livonian Z.K. from 1921.

** Average price January-April, 1926.

Average Prices of Commodities—Contd.

No of Article	32A	32B	33	34	37-38	35A	33B	350	36A	36B	37	No Art
	Wool			Silk		Hides			T. Hides		Tallow	
Year	Merino, Port Phillip Average Fleece	Merino, Adelaide, Average Greasy.	English Lincoln Half Hog	Twist †	Twist Total	Price Plate, Dry	Price Plate, Salt	Average Import Price	Dressing Hides	Average Import Price	Town	Yt
	d per lb	d per lb	d per lb	d per lb		d per lb	d per lb	d and salt per lb	d per lb	d per lb	9 per cent	
1873 ...	25	11½	24½	21½	—	11	8½	—	18½	—	44	187
'96 ..	13	6½	11½	10½	—	6½	5½	4-89	13½	13½	21	'96
1911 ..	17½	8½	10	10½	—	9½	7½	7-17	17	17½	33½	191
'12 ..	17½	9½	10½	10½	—	10½	8½	7 51	17½	17½	33	'12
'13 ..	18	9½	12½	11	—	12½	9½	8 62	19½	19½	34½	'13
'14 ...	18½	9½	12½	10½	—	13½	9½	9 11	21½	19½	31½	'14
'15 ...	21½	10½	17½	9½	—	13	11	10 04	28½	21½	36½	'15
'16 ..	32½	16½	20	16½	—	14½	13½	11 70	28½	27	46½	'16
'17 ..	46½	23½	20½	21½	—	20	16	15 52	35	34½	62½	'17
'18 ..	47½	23½	18½	25½	—	20½	13½	15 9	32½	32½	81½	'18
'19 ..	67	32½	22½	26	—	22½	19½	17-1	36½	40½	87½	'19
'20 ..	79½	32	22	38½	—	20½	18½	20 1	43	71½	75	'20
'21 ..	31½	11½	8	26½	—	9½	8½	9 58	25½	46½	36½	'21
'22 ..	39	17½	9½	28½	—	9½	8½	8 06	24½	36	34½	'22
'23 ..	43½	20½	12	24½	—	9½	8½	9 23	23½	31½	36½	'23
'24 ..	53½	25½	18½	28½	—	10½	8½	8 63	22½	33½	42½	'24
'25 ..	41½	17½	17½	18½	—	11½	8½	9 87	23	33	42½	'25
'26 ...	36½	16½	15	15½	—	10½	8	9 32	21½	35½	38½	'26
'27 ...	35½	17½	15½	15½	—	12½	10½	9 85	22½	36½	33½	'27
'28 ...	37	17½	17	14	—	15½	11	12 9	23½	37½	30½	'28
Average	17½	9	10½	11½	—	9½	7½	6½	16	17	31½	Av
1904-13	13½	6½	10	11½	—	6½	5½	5	13½	13½	25	190
1890-99	18½	8½	11½	15	—	8½	6½	6½	15	17	35½	'18
'78-87	21½	9½	19½	23	—	9	7	6½	16	18½	45	'19

Index-Numbers (or Percentages) of Prices, the Average of 1887-77 being 100

1873 ..	118	—	124	95	822	120	—	—	114	—	97	18
'96 ..	62	—	58	46	435	77	—	—	84	—	77	19
1911 ...	53	—	51	47	609	106	—	—	99	—	74	'
'12 ...	86	—	53	46	610	114	—	—	101	—	73	'
'13 ...	88	—	63	48	670	133	—	—	112	—	76	'
'14 ...	90	—	64	47	647	139	—	—	118	—	70	'
'15 ...	104	—	88	43	739	149	—	—	145	—	61	'
'16 ...	159	—	101	71	1,031	174	—	—	160	—	104	'
'17 ...	219	—	106	94	1,635	225	—	—	200	—	139	'
'18 ...	222	—	95	112	1,772	218	—	—	188	—	182	'
'19 ...	315	—	114	113	1,820	253	—	—	222	—	195	'
'20 ...	359	—	111	168	2,099	257	—	—	330	—	167	'
'21 ...	140	—	44	115	1,117	123	—	—	205	—	81	'
'22 ...	180	—	49	125	1,075	114	—	—	174	—	77	'
'23 ...	206	—	61	105	1,121	113	—	—	158	—	61	'
'24 ...	254	—	96	102	1,362	119	—	—	163	—	94	'
'25 ...	188	—	87	79	1,319	132	—	—	161	—	94	'
'26 ...	170	—	76	69	1,063	121	—	—	164	—	85	'
'27 ...	177	—	78	67	1,045	142	—	—	172	—	75	'
'28 ...	174	—	91	61	1,086	172	—	—	176	—	62	'

* Port Phillip fleece washed nominal since 1895, exactly in proportion with the value of clean wool.

† Common New Style from 1921.

Average Prices of Commodities—Contd.

of article	38	39	40A	40B	41	42	43	44	45A	45B	43-45	20-45	1-45
	Oil.			Seeds	Petro- leum	Soia	Nitrate of Soda	Indigo	Timber		Sundry Materials	Materials.	Grand Total.
	Palm	Olive	Lin- seed	Lin- seed	Refined	Bengal, Good Consum- ing			Hewn, Average Import Price.	Sawn or Split, Average Import Price			
or	£ per ton	£ per ton	£ per ton	£ per qr	d per gall	s per ton	s per cwt	s per lb	s per cwt	s per load	Total	Total	
3 ...	38	43	32	62	15½	100	15½	6½	65	62	—	—	—
3 ...	22	30	17½	33	5½	42	8	4½	40	44	—	—	—
1 ...	34½	50	42½	70	5½	57	10	3	38	57	—	—	—
2 ...	33	48	35½	60	8½	53	11½	2½	41	60	—	—	—
3 ...	35½	49½	24½	45½	8½	47½	11½	2½	40	63	—	—	—
4 ...	37½	50½	24½	48½	7½	47½	10½	5½	41½	64½	—	—	—
5 ...	34½	51½	30½	57½	8½	48½	12½	13½	58½	94½	—	—	—
6 ...	44½	59½	41½	80½	12	78½	17½	13½	82½	148½	—	—	—
7 ...	46	115½	56½	112½	16½	89	25	10½	97½	210	—	—	—
8 ...	44½	198½	63½	131½	21½	82½	27½	9	107½	271	—	—	—
9 ...	69½	200½	92½	139½	17½	118½	24½	9½	137½	232½	—	—	—
0 ...	69½	200½	88½	157	25½	150½	24½	14½	119½	261½	—	—	—
1 ...	36½	80½	31½	72½	22½	140	18½	11½	68½	156½	—	—	—
2 ...	34½	75½	39½	75½	15½	123	14½	9½	46½	117½	—	—	—
3 ...	36½	66½	42½	77½	13	103	13½	7½	48	131½	—	—	—
4 ...	40½	79½	42½	81½	13½	101½	13½	6½	49½	122	—	—	—
5 ...	40½	73½	43½	80½	13½	100	13½	5½	47½	122½	—	—	—
6 ...	37½	79½	32½	63½	13	100	13½	5½	48½	107	—	—	—
7 ...	34½	102½	31½	64½	13	100	12½	5½	45½	107½	—	—	—
8 ...	35½	80½	29½	66½	11½	100	10½	5½	45½	111½	—	—	—
average	31½	43½	26½	49½	6½	60	10½	3	38	56	—	—	—
10-13	24½	35	19½	38	5½	53	8½	4½	40	45	—	—	—
14-17	32½	40	23	46	6½	62	12½	6	47	47	—	—	—
18-21	39	50	30	60	12½*	92	14	7½	60	54	—	—	—

Index-Numbers (or Percentages) of Prices, the Average of 1867-77 being 100

73 ...	97	86	105	122	109	110	92	111	1,163	2,974	5,011
96 ...	56	60	56	44	40	57	59	74	690	1,569	2,742
11 ...	88	100	125	43	62	71	41	83	892	2,155	3,586
12 ...	85	96	106	66	58	80	38	89	906	2,287	3,831
13 ...	90	99	78	68	52	52	38	90	918	2,363	3,820
14 ...	84	101	82	61	52	78	80	93	958	2,296	3,832
15 ...	89	104	97	71	53	90	184	134	1,197	2,816	4,844
16 ...	114	119	135	96	86	128	183	202	1,501	3,641	6,117
17 ...	118	231	187	129	98	178	142	270	1,917	4,655	7,866
18 ...	115	396	216	170	90	194	124	332	2,225	5,344	8,661
19 ...	178	400	258	138	128	177	126	325	2,405	5,763	9,278
20 ...	179	400	272	203	164	177	200	335	2,684	6,851	11,298
21 ...	95	160	116	177	152	135	158	198	1,600	3,985	6,991
22 ...	89	151	127	122	134	102	128	143	1,361	3,430	5,895
23 ...	93	133	134	104	112	96	103	187	1,284	3,488	5,806
24 ...	103	160	138	105	111	97	84	151	1,325	3,792	6,267
25 ...	104	147	137	105	109	96	79	150	1,314	3,713	6,142
26 ...	96	159	106	104	109	95	78	137	1,254	3,395	5,662
27 ...	88	205	107	104	109	90	76	134	1,302	3,337	5,503
28 ...	92	161	108	94	109	78	76	138	1,286	3,232	5,396

* Petroleum average, 1873-77.

† Nominal.

MISCELLANEA.

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RICKMAN'S SECOND SERIES OF EIGHTEENTH-CENTURY POPULATION FIGURES.*

By G. TALBOT GRIFFITH.

JOHN RICKMAN, who was in charge of the first four Censuses and wrote the Introductions to the Census Reports, made two series of calculations of the pre-Census population of England and Wales, using the enumerated population of 1801 as his starting-point.

Rickman's first series of figures are published in the Report on the 1801 Census and reappear in the Reports on the next three Censuses—1811, 1821, 1831. Under the Population Act of 1800 the number of baptisms, in 1700, 1710, 1720, 1730, 1740, 1750, 1760, 1770, 1780 and every subsequent year was required from "The Rector, Vicar, Curate or Officiating Minister" of every parish in England and Wales. From this information Rickman proceeded to make a calculation of the population of England and Wales at the decennial years of the eighteenth century and also at 1785 and 1795. The formula on which he worked he stated as follows :— †

"Thus, if 255,426 Baptisms (the average medium of the last five years) were produced from a population of 9,168,000, from what population were 152,540 (the baptisms of 1700) produced?"

I have discussed possible sources of error in this argument elsewhere and they need not detain us now.

Rickman's second estimate was published in the Report on the 1841 Census.

In October 1836 Rickman sent a circular letter to the Officiating

* I am under a debt of gratitude to Mrs. Hammond for drawing my attention to the volume of MS. notes alluded to in this paper, and to the Registrar-General, Somerset House, in the Library of whose Department it is preserved, for his courtesy in giving me access to the volume.

† *Preliminary Observations on the 1801 Census*, p. 9.

Minister of parishes known to have old Registers, and requested from them figures for baptisms, burials and marriages for three years at the following dates:—1570, 1600, 1630, 1670, 1700 and 1750. With these figures he worked out for each county a population figure from baptisms, burials and marriages, and finally an average, using as his starting population figure the enumerated county population of 1801. The addition of these county results provided a national total, which is set out in detail on pp. 36 and 37 of the Report to the 1841 Census.*

The Census Report prints a copy of the circular letter sent to the clergy, some rather scrappy remarks on the figures and the figures themselves. One extract from the remarks is necessary.†

“ His (Rickman’s) lamented death in 1840 prevented his taking any further part in forwarding the present Census; and these calculations having been delivered by his executors to the Home Office, were transmitted to us with other documents relating to the business of the Census. The calculation of the population at the various periods were deduced from returns of baptisms, burials and marriages obtained by extracts from the registers of such parishes as possessed documents of an early date.”

There has come to light in the General Register Office a bound volume of manuscript notes and workings from which these estimates for the pre-census population were derived. The description on the outside of the volume—rather an inadequate description of its contents—is as follows:—

Parishes
possessing Registers
extant 1570 and 1600
with their
population in 1801.

The volume consists of three volumes of ruled foolscap with some additional pages bound in at the end. The three notebooks are similar, with watermarks of date 1836. The few additional pages are of the same size and bear watermark 1833. The handwriting throughout is neat, formal and upright. I have seen some specimens of Rickman’s handwriting preserved among the Colchester papers in the Public Record Office which date from the early years of the century. The writing is in a clear and legible Italian hand. I do not know how differently Rickman might have written when preparing a manuscript for the Press, but after seeing the two handwritings I incline to the opinion that the volume at Somerset House

* See Table I.

† *Census Report 1841*, p. 34.

is in the hand of a clerk preparing Rickman's work for the printers.

The contents of the book are as follows:—

(1) A list of Parish Registers in each county extant in 1570, with the population of those parishes in 1801, and additional parishes with Registers extant in 1600 and their population in 1801; a summary of these two sets of figures county by county and some short remarks about the Registers. This information occupies about one and a half notebooks—the second half of the second notebook is unused.

(2) The third notebook and the additional pages are filled as follows:—

(a) A page of Headings.

“Population of England and Wales in the years 1570, 1600, 1630, 1670, 1700 and 1750, estimated by assuming in those years the same proportion of Parish Register Entries to the existing population as in the years 1800 and 1801 (in the last of which the population was first actually enumerated).”

“The number of Entries of Baptisms, Burials and Marriages in all Parish Registers extant in the first mentioned years having been collected for the above purposes.”

“And herein it is to be understood, that the average number of Entries in the three years (1569, 1570, 1571) forms the basis of calculations for the year 1570; and a similar average for the years 1600, 1630, 1670, 1700 and 1750.”

(b) A Table of Contents divided into four sections.

Sec. 1. A Manuscript draft of the printed form to be used for giving the information about baptisms, burials and marriages.

Sec. 2. “A table of the proportion of Parish Register Entries extant at various periods.” The information contained herein is explained by the following example:—

“The population in 1801 of the parishes in the County of Bedford which possess Registers in the years 1570, bears a certain proportion to the entire population of the County of Bedford, which proportion is expressed in the decimal form of percentage in the following table.”

These proportions range from none in Monmouth and North-umberland in 1570, and $\cdot 12$ in Monmouth in 1600 and $\cdot 30$ in North-umberland, to $\cdot 73$ in Chester. For a summary of the country as a whole as recorded in the notebook see Table II.

Sec. 3. “Calculations of the populations of the several counties of England and in Wales at the various periods.”

In this section there is a separate calculation for each county and for Wales, a calculation for England as a whole, and a calculation

for England and Wales as a unit. These must be examined more closely in a moment.

Sec. 4. "Summary of the said calculations." This summary, with three slight modifications, as explained in the next paragraph, is the one published in the 1841 Census Report.

The enumerated population of England, the result of the sum of the county populations, is printed in the Census Report as 8,331,434. In the Manuscript summary it is 8,331,634—a difference of 200. The county items are the same in both cases and the addition in the printed Report is right. This is a small arithmetical error which was doubtless corrected in the checking before printing. It is interesting to note that Rickman used the figure 8,331,634 for his calculations for the population of England as a unit and England and Wales together as a unit. There was no discrepancy between the Manuscript and the printed Report in the population of Wales (541,546). The figures in the Manuscript for 1600 and 1700 differ slightly from those in the printed Report. In 1600 the difference in the final figure is 21—4,811,697 in the manuscript as against 4,811,718 in the Report; and 13 in 1700—6,044,995 in the Manuscript as against 6,045,008 in the Report. As in the case of the figures for the population, it is probable that the error is arithmetical and would be traced if all the figures were checked. The discrepancy occurs in the 1600 figures in the population of England estimated from burials and marriages, and in 1700 in the figure for England derived from baptisms.*

In addition to the separate county populations this manuscript notebook, as we have mentioned, also contains (in Section 3) for the various years a population figure calculated in the same way for England as a whole and another for England and Wales as a whole. These differ from the results obtained by the sum of the calculations from county to county, printed in the summary in Section 4, and are not mentioned in the 1841 Census Report. The results are shown in Table IV.† Rickman's formula for England and Wales is as follows:—

"If 79,634 baptisms in 3,104 parishes containing 2,783,636 inhabitants in the year 1800, coincided with a population of 8,873,180 in 1801, what population is indicated by 34,166 baptisms in the same parishes in the year 1570?"

This formula, modified to suit the larger number of parishes for which records had survived in 1600 and subsequent years, is used throughout the series.

* See Table III.

† See Table IV.

Criticism of Rickman's 1841 estimate has generally followed the lines of the criticism of his 1801 series. The 1801 figures assumed a constant baptism rate for the eighteenth century which is now pretty generally agreed to be unwarranted. These 1841 figures not only assume a constant baptism rate for the eighteenth century, but also constant burial and marriage rates as far back as 1570.

Rickman states in a letter published on page 35 of the 1841 Census Report the number of parishes from which he expected returns. His figures, in round numbers 3,000 for 1570 and 4,000 for 1600, are actually under-estimates, except for the registers recording marriages in 1570. The numbers of registers used for the population figures derived from baptisms, burials, and marriages, with their enumerated population in 1801 are set out in Table V.* Here the greatest number mentioned is 4,269. The baptism figures used to calculate the eighteenth-century population in the 1801 series were derived from 11,065 Parish Registers in England and Wales. In 1811 Rickman said that in this figure there was some duplication, and that the figure should in reality have been 10,643. Great care was taken to secure an accurate and comprehensive return of Parish Registers in 1811, and Rickman was satisfied that the figure, 11,159, for that year is within three or four of the truth, and this contrasts very favourably with the figures used for the 1841 series.†

Already in Table II some figures have been given which demonstrate the scope of the information on which these 1841 figures rest. Wales throughout is treated as a unit, but the 31 parishes used in Wales for the calculation based on baptisms after 1600 contained in 1801, 32,332 inhabitants, or 5.9 per cent. of the enumerated population of Wales in that year. In England the population in 1801 in the parishes contained in the manuscript list of parishes having Registers of Baptisms extant from 1600 amounted to 3,921,829, or 47.07 per cent. of the enumerated population of 8,331,434 for England in 1801. The total of parishes counted was 4,269.‡ The preliminary work on the 1801 series has not come to light,§ but Rickman's figure for baptisms for 1700 on which he worked the population figure for England and Wales in that series is 152,540 as against 71,424 in the 1841 series. He was obviously, therefore,

* See Table V.

† *Prelim. Obs. 1811 Census*, pp. xviii-xix.

‡ This differs slightly from the figure which results from adding together the county summaries of extant registers contained in the notebook (4,261); the discrepancy would possibly be localized if all the remarks on the registers were carefully inspected.

§ The original returns from the Parish Registers were destroyed by order of a Departmental Committee in 1904. See Mrs. Hammond's article, *Econ. Journal, Econ. Hist. Supp.*, No. 3, p. 420.

using a figure for baptisms much more nearly covering the whole country in 1801 than he was in 1841.

The late Professor Gonner, in a paper on the Population of England in the Eighteenth Century, published in the *Statistical Journal* for February, 1913, does not mention Rickman's 1801 calculations, and when he deals with the second series he says, "figures are deduced . . . on what seems to be the assumption that population stood to the average of baptisms, marriages and burials in the same ratio at the respective dates as in 1841 or thereabouts." * Whereas, as a matter of fact, it is perfectly clearly stated in the 1841 Report that the starting-point of the population was the enumerated population of 1801.† The manuscript notebook, as we have seen, confirms this.

Sir Ernest Clarke, in the course of a discussion on Gonner's paper, said that "he could not feel much reliance on any of the estimates of the population of England at different periods of the eighteenth century, made prior to the exhaustive inquiries on this particular point about the year 1836 by John Rickman." ‡ We have seen that the general criticisms levelled against the 1801 series can, in an even greater degree, be levelled against the 1841 series and that also there is the additional criticism of the 1841 series that it is based on calculations from parishes containing less than half the population of the country.

Professor Gonner, in his reply to the discussion, said of the 1801 series that "there was no information as to how these figures were arrived at." As a matter of fact the sources of the two series are the same—namely, the information from Parish Registers submitted by the Incumbents. It is difficult to see why one series should be more reliable than the other. At any rate there is information as to how the figures were arrived at

Further on in the discussion, speaking of the 1841 series, he says "that inquiry was a very careful and accurate one. It consisted not of selected cases or places, but an actual return from registers in each parish in the country uniformly for three years about the particular dates." He went on to say that Rickman had made allowance for faulty registers; but the 1841 Report does not say what allowance is made. To say that the 1841 figures were not based on "selected cases or places" when they were based on about half the parishes in the country is unfortunate. Finally, it is not correct to say that these figures were based on "an actual return from registers in each parish in the country." Gonner's laudatory remark, if it applies with truth to either of Rickman's series, applies to the

* *Stat. Journ.*, Vol. 76, p. 283.

† *Report on 1841 Census*, p. 35.

‡ *Stat. Journ.*, Vol. 76, p. 301.

1801 series, which he ignores in his paper and dismisses as unworthy of serious consideration in his reply to the discussion.

TABLE I.

Population of England and Wales, Calculated from the Figures for Baptisms, Burials and Marriages (Three-year Averages).

		Baptisms.	Burials.	Marriages.	Average.
1570	England	3,528,457	3,765,135	3,919,932	3,737,841
	Wales	323,665	402,227	541,546	422,479
	E. and W.	3,852,122	4,167,362	4,461,478	4,160,321
1600	England	4,539,180	4,029,355	4,812,827	4,400,454
	Wales	343,879	335,282	374,631	351,264
	E. and W.	4,883,059	4,364,637	5,187,458	4,811,718
1630	England	5,140,603	5,404,549	5,130,637	5,225,263
	Wales	387,177	393,627	344,957	375,254
	E. and W.	5,527,780	5,798,176	5,475,594	5,600,517
1670	England	4,931,019	6,746,076	4,508,461	5,395,185
	Wales	325,681	453,617	356,085	378,461
	E. and W.	5,256,700	7,199,693	4,864,546	5,773,646
1700	England	5,404,004	6,236,843	5,318,336	5,653,061
	Wales	324,426	424,855	426,560	391,947
	E. and W.	5,728,430	6,661,698	5,744,896	6,045,008
1750	England	5,913,212	6,329,983	5,954,927	6,066,041
	Wales	464,362	387,875	500,745	450,994
	E. and W.	6,377,574	6,717,858	6,455,672	6,517,035

TABLE II.

Proportion which the Population of the Parishes whose Registers are used in Rickman's second series of Population Figures bears in 1801 to the total Population of England and Wales in 1801, shown as a decimal form of percentage.

Registers dealing with						
	Baptisms.		Burials.		Marriages.	
	1370.	1600-1750.	1370.	1600-1750.	1570.	1600-1750.
England	0.33	0.47	0.33	0.47	0.32	0.46
Wales	0.02	0.06	0.02	0.06	0.01	0.05
E. and W. ...	0.31	0.44	0.31	0.44	0.30	0.43

TABLE III.

Variations in the Manuscript Copy from the Printed Population Figures in the 1841 Census.

(Only variations entered.)

Population figure from					
		Baptisms.	Burials.	Marriages.	Average.
1600	England E. and W.		4,029,347 4,364,620	4,812,773 5,187,404	4,460,433 4,811,697
1700	England E. and W.	5,403,964 5,728,890			5,653,048 6,044,995

TABLE IV.

Population of England and Wales (reckoned as one unit).

Population figure from				
	Baptisms.	Burials.	Marriages.	Average.
1570	3,806,930	4,019,038	4,154,655	3,993,541
1600	4,830,318	4,201,088	4,971,167	4,667,524
1630	5,434,849	5,708,985	5,354,387	5,499,407
1670	5,163,823	7,065,671	4,738,562	5,650,019
1700	5,648,618	6,552,596	5,540,294	5,915,836
1750	6,202,060	6,679,409	6,160,635	6,347,368

TABLE V.

Numbers of Parishes supplying Registers for the 1841 Series of Population Figures, with their 1801 Enumerated Population.

Registers dealing with						
(I) Baptisms.						
	England.		Wales.		E. and W.	
	Parishes.	Popn.	Parishes.	Popn.	Parishes.	Popn.
1570	3094	2,771,134	10	12,502	3104	2,783,636
1600-1750	4269	3,921,829	31	32,332	4300	3,954,161
(II) Burials.						
1570	3037	2,729,809	10	12,502	3047	2,742,311
1600-1750	4216	3,884,435	30	32,247	4246	3,916,682
(III) Marriages.						
1570	2925	2,664,465	8	7,693	2933	2,672,158
1600-1750	4066	3,812,061	26	26,606	4092	3,838,667

NOTE ON THE χ^2 TEST FOR GOODNESS OF FIT.

By J. O. IRWIN, M.A., M.Sc.

(Rothamsted Experimental Station.)

SUPPOSE we have a set of observed frequencies $n_1, n_2 \dots n_s$ (total N) and that by some process we have fitted a curve to them, the "theoretical" frequencies being $m_1, m_2 \dots m_s$ (total N), and that we wish to test for goodness of fit. There are two alternative hypotheses which we may regard ourselves as testing.

I. We may suppose that we have a hypothetically infinite population in which the proportional frequencies in the s categories are $p_1, p_2 \dots p_s$

$$\text{where } p_r = \frac{m_r}{N},$$

and that samples of N are drawn at random from this population, and that for each sample

$$\chi^2 = S \left\{ \frac{(m_r - n_r)^2}{m_r} \right\} \text{ is calculated.}$$

Here $m_1, m_2 \dots m_s$ are taken as the population values and are therefore supposed to be invariable from sample to sample. In this case it may be shown that the distribution of χ^2 is

$$C(\chi^2)^{\frac{s-3}{2}} e^{-\frac{1}{2}\chi^2} d\chi^2.$$

This is the Classical Pearsonian Method.

II. We may suppose our proportional frequencies in the population to be $\frac{M_1}{N}, \frac{M_2}{N}, \dots, \frac{M_s}{N}$, where we do not know the values of the M 's, and that samples of N are drawn at random from it, and that from the observed frequencies $n_1, n_2 \dots n_s$ in each sample a set of theoretical frequencies $m_1', m_2' \dots m_s'$ are estimated by the same process as is adopted in the actually observed sample, and that for each sample

$$\chi^2 = S \left\{ \frac{(m_r' - n_r)^2}{m_r'} \right\} \text{ is calculated.}$$

Here $m_1', m_2' \dots m_s'$ vary from sample to sample, and in the observed sample $m_r' = m_r$.

In this case the distribution of χ^2 will depend on the process of

fitting employed; if four moments are used in fitting, then it may be shown that the distribution of χ^2 is

$$C(\chi^2)^{\frac{s-7}{2}} e^{-\frac{1}{2}\chi^2} d\chi^2,$$

provided the statistical estimates used are efficient.

The two results differ because we are calculating the frequency distributions of two different quantities, and it is not a question for mathematics alone to determine which method is the more reasonable.

The writer favours the second method, first, because it dispenses with the somewhat arbitrary assumption of a particular population

$\frac{m_1}{N}, \frac{m_2}{N} \dots \frac{m_s}{N}$ from which to test divergence—a population which naturally is not quite coincident with the true population; secondly, because it assumes that χ^2 is calculated from each sample by the method actually used in the observed sample and makes no arbitrary assumption about the population frequencies at all. Of course we are at liberty to test divergence from any population we please, and in particular from one in which the proportional frequencies are $\frac{m_1}{N} \dots \frac{m_r}{N} \dots \frac{m_s}{N}$; it is only a question whether it is appropriate to do so. It seems to the writer inappropriate because, if we do so, we are selecting a population, from which to test, which is biased in the direction of the observed sample, and the resulting value of χ^2 is consequently too small or we exaggerate the probability that the sample was drawn from the population. The reader can realize this very easily if he remembers that, if we had chosen a curve for fitting with enough disposable constants in it, every m could have been made equal to the corresponding n , and χ^2 would then have been zero.

Experimental evidence is not in itself conclusive, as an experiment may be designed to test either hypothesis. For example, if we tossed 10 pennies 100 times and recorded the frequencies of 0, 1, 2 . . . 10 heads and repeated the process a large number of times, say 1,000, if we calculated our theoretical frequencies from the binomial $100(\frac{1}{2} + \frac{1}{2})^{10}$ in each case, then we should verify that χ^2 was distributed as

$$C(\chi^2)^{\frac{s-3}{2}} e^{-\frac{1}{2}\chi^2} d\chi^2,$$

s being in this case 11.

But if we assume our binomial to be $100(p + q)^{10}$ and estimate p (and q) separately for each sample by the usual method of equating the mean of the sample to the corresponding quantity in the binomial, subsequently calculating the theoretical frequencies from the values of p and q so determined, and finally calculate χ^2 for each

sample, using these "theoretical frequencies," then we should verify that χ^2 was distributed as

$$C(\chi^2)^{\frac{s-4}{2}} e^{-\frac{1}{2}\chi^2} d\chi^2.$$

The reviewer of Mr. Fry's *Probability* * in the *Journal of the Royal Statistical Society* remarks that methods of fitting may be adopted for which we should not know the distribution of χ^2 on the second hypothesis. The writer agrees that such methods may be adopted, but thinks they do not test any interesting hypothesis. For example, to take the reviewer's case, by applying the goodness of fit test to a curve drawn by eye by an expert draughtsman we can only test the ingenuity of the draughtsman in making the frequencies of the fitted curve agree as nearly as possible with those of the histogram.

In any case the existence of such methods is no argument for not using hypothesis II whenever possible, as it is the least artificial one that can be made. It must, however, always be borne in mind that mathematics alone cannot decide the question. Only when we have decided the precise question we wish to ask will mathematics provide the answer.

These remarks have been made after a careful perusal of the available literature on both sides of the question, and it is hoped they may be of use to readers of the *Journal of the Royal Statistical Society*.

* *J.S.S.*, Vol. XCI, Part IV., 1928.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Inleiding tot de Beoefening der Statistiek*. By Dr. C. A. Verrijn Stuart. Pt. 1 (Demography). 2nd edition. 459 pp. Haarlem: Bohn, 1928. Price 12 f.

All statistical text-books combine the theory of the art (or science) with a description of results reached by statisticians; but in some books the results are merely illustrative of the applications of the methods, while in others the theoretical matter is no more than an introduction to a study of results. Dr. Verrijn Stuart's book belongs to the latter class. His first four chapters, which are devoted to statistical methodology, contain many sensible comments, but would be a wholly inadequate introduction to the practice of statistical investigation. Similarly, the description of the method of construction of life tables which appears later in the volume, pp. 352 *et seq.*, does no more than give the reader a general idea of the business in hand. The next chapter is an excellent sketch of the history of statistics, and Dr. Verrijn Stuart has earned our gratitude by quoting Schnapper-Arndt's defence of the wisdom of Jehovah. As he suggests, Jehovah was not angry with David because he numbered the children of Israel, but because he numbered them so inaccurately. The next chapter is a detailed account of the modern history of Dutch demographic statistics and of the work of the International Statistical Institute. This chapter—together with supplementary notes interspersed through later chapters—is of particular value to a

foreign reader. Dutch vital statistics are very good, and Dr. Verrijn Stuart probably knows more about them than any other man. The remainder of the volume follows the usual order; statistics of population, births, marriages, deaths, and migration are described in turn. If one compares the book with Dr. Prinzing's, to which it has some affinity, one may say that Dr. Verrijn Stuart gives a fuller account of population data (here and elsewhere he rightly gives prominence to Dutch data) and less information upon more strictly medical statistical data. The style is clear, so that the book can be read without much difficulty by a foreigner who (like the reviewer) knows very little Dutch. It can be recommended to an intelligent general reader; for instructional purposes it would need to be supplemented by a work on statistical methodology. M. G.

2.—*Cours de Statistique, professé en 1927-8 à la Faculté de Droit.* 320 pp. Paris: Les Presses Universitaires de France, 1928. Price 40 f.

These lectures, delivered by Professor Aftalion, have been collected and edited by M. L'Homme and Dr. Priou. It is not stated that they have been submitted to the lecturer before issue, and there is therefore no guarantee that they represent his views exactly as he would wish to express them in a finished form. The book appears to be photographed from a finely written manuscript, and the result is very pleasing, for the arrangement of equations, suffixes, etc., and the placing of sketch diagrams, give a more vital form to the mathematical part of the analysis than is obtained by any except the very best printing. Reproduction in this form is said to be very much cheaper than printing, and it might well be widely adopted for mathematical and statistical work of an ephemeral character. It would be an interesting reversion if the craft of fine writing replaced the setting of type.

The lectures expound the principles and elementary methods of statistics mainly on familiar lines, but with more emphasis on series and less on averages than is usual. Though simple mathematical formulæ are freely used, proofs are only given in the most elementary cases; for example, even when an easy quadratic operation establishes a minimum, as in the case of the correlation coefficient, the result is stated without proof. Nevertheless, the reader is expected to understand the multiple regression formula in Mr. Yule's notation. The approach to correlation is rather on the lines of reducing the standard deviation of a measurement, than of those of measuring interconnection; and this idea is consistently carried out in the applications of the coefficient. A high value of the coefficient implies only that a good approximation can be obtained.

Important features of the book are the very careful logical distinction, which Professor Aftalion continually makes, between numerical and causal relationships, and his very acute criticisms of the actual meaning of such relations as Professor Moore and others have found between statistics of supply, prices, etc. Considerable space is, in fact, devoted not to the elements of statistics, but to the application of series and of regression equations to the study of

economic facts; the Third Part, of 65 pages, contains an account of the methods used by the Harvard Committee and by several writers for forecasting economic phenomena. The criticism of these methods is perhaps the most important part of the book.

Possibly if Professor Aftalion had revised the manuscript he would have laid less emphasis on the prevalence of a moderately unsymmetrical curve of frequency, which he is inclined to assume as very general. "There is a certain distribution moderately unsymmetrical of qualities, aptitudes, wages and incomes for all men. The distribution of social, intellectual and moral phenomena is sensibly the same." Perhaps also he would not have given so much prominence to the formula $\text{Mode} = \text{Mean} - 3(\text{Mean} - \text{Median})$; for this depends on a close approximation to a not very common form of the Law of Error, and already is commonly stated in text-books as applicable to groups whose frequency distribution is not known. It is to be regretted that he appears to approve the practice of smoothing curves by two straight lines, intersecting acutely, when the direction of the trend changes; perhaps he does not hold the balance even between the rival methods of least squares and of moving averages. It is a defect, due to the limitations of the mathematical knowledge assumed, that the rationale of least squares is not seriously discussed and its arbitrary nature made clear.

A. L. B.

3.—*Some Economic Factors in Modern Life.* By Sir Josiah Stamp, G.B.E. vii + 279 pp. London: P. S. King & Son, Ltd., 1929. Price 10s. 6d. net.

Nothing can stale the infinite variety of Sir Josiah Stamp's interest in economic problems, and the extent of the scope of his curiosity is indicated by the addresses reprinted in this volume. *Æsthetics*, *Inheritance*, *Invention*, *Industrial Co-operation*, *Amalgamations*, *Stimulus* are the economic factors which occupy his attention in the first three-fourths of the book, and the remaining section is devoted to a consideration of the possibility of verifying or improving economic theory by statistical investigations and to a warning as to the diverse ways in which the human element may affect the nature and validity of statistics. He modestly says: "I do not choose a subject necessarily because I think I know a great deal about it, but rather because I have, at various times, put to myself questions to which I do not know the answers, and the choice of a title to cover them forces me in the meantime to find the answers if I can, or at any rate to determine the limits within which answers are in fact likely to be available, and the area over which detailed or *ad hoc* enquiry is necessary before satisfactory answers can be completed." We are admitted to the study of the eminent economist, and are privileged to see his mind at work, breaking up the subject of the moment into its elements, putting each into the witness-box to declare its nature and importance, then recombining them, and then either distilling from the examination some new form of economic truth or putting the material back till some more satisfactory method of treatment has been found.

Sir Josiah's methods are nowhere better exemplified than in his discourse on Inheritance delivered as his Presidential Address before Section F of the British Association, and reproduced here with modifications and with an appendix on Rignano's proposals for taxing inherited property. After a discussion of the bearing of the right of bequest as a stimulus to wealth production which will increase the social heritage that falls to the whole community, he sketches lightly past and current thought on the subject, and then draws up a schedule of seventeen questions pertinent to the economic enquiry. Discussing each in turn, he tries to find answers, his broad conclusions being that "the principle of inheritance or bequest has played an important part" in the past in the accumulation of savings, but that to-day "communal saving via company reserves (not subjected to the individual volition for saving against spending), and via repayment of debt through funds derived from taxation, and via large capital efforts (housing, etc.) partly financed through taxation, is an increasing proportion of the total. . . . The remaining considerable section of capital accumulation is still powerfully affected by inheritance rights, and would be more affected than heretofore by interference with rights in the direct line, though less affected than hitherto by rights out of that line."

Humane, in the literary sense of the term, is his treatment of the relation of æsthetics to economics, and we are far away indeed from the "dismal science." "Yes," he exclaims, "if a wider possession of historical perspective is essential to balanced judgment on social evolution—and this is essential to the wise development of democratic institutions, and thus to sanity in economics—then objectivity and actuality are the main gateway to that sense of history we should value so much. Every illustration, in a cottage, or manor-house, or abbey, or tithing barn, or keep, is a popular educator leading, not far away, to better economic insight." "Maximum economic good is not synonymous with maximum production unless the production is a balanced one—balanced in accordance with an all-round exercise of human faculties." "Maximum economic production does not lead necessarily to maximum economic satisfaction." When economic policy and æsthetic values collide "we get the actual conflict between private economic gain and public economic gain, and not between private economic gain and public sentimentality." These views are trite enough, old-fashioned enough, and, when one comes to think over them, true enough to show that the modern cult of curves and formulæ does not exhaust all economic significance.

The address on Invention distinguishes usefully between the period of "scientific gestation" of a new idea and the period of "industrial gestation" up to its full acceptance, and treats among other topics of the harnessing of the inventor in a team in the service of large economic units. "Industrial Co-operation," a discourse to the Institute of Transport, contains an interesting account of the efforts to enlist the men of the L.M.S. Railway in a combined attempt to restore prosperity to the system. "Amalgamations" covers well-trodden ground, but still familiar features are viewed

from a new standpoint. The Rede Lecture on "Stimulus in Economic Life" has already been reviewed in Part II of the *Journal* for 1928.

The two last addresses in the book are of special interest to statisticians. Sir Josiah appears to agree with Wesley Mitchell that students are proceeding to establish economics as a quantitative science, and that, quoting Mitchell, "in so far as they accomplish this aim they will in transforming the subject make obsolete not only the qualitative work of Dr. Marshall and others, but also the crude beginnings of quantitative work which their elders are producing." One may agree with the last clause, for much of present-day work in the application of mathematical methods to economic data appears to the reviewer as simply the learning how to handle new tools and not the production of valuable goods. Often a proof of the obvious is secured and held up in triumph, and the real successes have been obtained in limited corners of the territory. Brilliant, for example, as is some of the work in Pigou's *Industrial Fluctuations*, one cannot admit Sir Josiah's complete acceptance of the results. Sir Josiah gives some interesting examples of the success of statistical investigations, but in his Sidney Ball lecture he seems to be carried away by the enthusiasm of the expert. The reader will do well to postpone judgment on that lecture until he has read the concluding address on "Human Nature in Statistics." He might, indeed, read with profit alternate pages of each! That random samples are not necessarily representative samples, that correlation does not necessarily imply causation, and that there are "nonsense correlations" are three truths always to be borne in mind.

"We all know the unusual type of mind that is required to analyse the familiar, and how quickly use and wont may blunt the sensibilities," says Sir Josiah Stamp, and in the Royal Statistical Society we well know that he possesses that type of mind in a high degree and never lets it become blunted.

H. W. M.

4—*The Balance of Births and Deaths* Vol. I, Western and Northern Europe. By Robert R. Kuczynski. 62 pp., with Appendix, 76 pp. Published for the Brookings Institution by the Macmillan Company, New York, 1928. Price 2 dollars.

As the title indicates, this is an elementary treatise on "fertility rates" with special reference to the conditions prevalent in certain European countries. It would be in place as a chapter in a text-book on vital statistics, but hardly justifies itself—or its price—as a separate publication.

The measurement of fertility by reference to the number of women, married and unmarried, between the ages of 15 and 50 is appropriate under normal conditions, but is hardly good enough in relation to a period when the deadliest war in history has taken its toll of potential fatherhood; in this connection the indiscriminate comparison of recent "fertility rates" of belligerent and neutral countries seems a blemish. The student of vital statistics may nevertheless find the work, and especially the Appendix, handy for

reference purposes. The author has perhaps a wider ambition: "With a fertility and a mortality as they have prevailed for some years the population of Western and Northern Europe is bound to die out." It is little comfort to be told that the process "will be rather slow," but what is to be done about it?

It will be interesting to see in the later volumes which the title promises, to what conclusion the author's studies lead him as to the future of other parts of the civilized world. A. W. W.

5.—*American Marriage and Family Relationships*. By E. R. Groves and W. R. Ogburn. American Social Science Series. xiii + 497 pp. New York: Henry Holt & Co. 1928. Price \$4.50c.

This study of American marriages is divided into two distinct sections. The first, by Professor Groves, deals with such questions as the development of marriage, its social significance, and its aspect in primitive tribes and under modern conditions; and also with the psychological problems of the husband, wife, and family. It is hardly within the province of a reviewer for this *Journal* to discuss this half of the book, and it is, perhaps, sufficient to say that the reader will find it very interestingly written and provocative of thought and discussion. For instance, the husband, or would-be husband, can consider how "rare it is for the man entering matrimony to understand how archaic and impossible the conventional thoughts of men with reference to their headship of the family have become"; while the wife can contemplate the statement that "as she has moved away from subserviency to her own self-expression she has been drawn into imitation and has to a surprising degree attempted merely to imitate the man." It is to be hoped that the ensuing discussion will not produce a need for reference to the later chapter entitled "Family Discord and its Treatment."

Of the second half of the book, devoted to a statistical study by Professor Ogburn, it certainly cannot be said that it makes such interesting reading, though it provides a mass of statistical tables and comments. It seems to deal with every possible factor that can be statistically related to married bliss, *e.g.* death-rates, criminality, insanity, poverty, history, sex ratio, age, race and nativity, the birth-rate, industry and the employment of women, urbanization and geographical position, and combinations and permutations of these and other factors. (It is rather saddening to find at the end of so much analysis that the evidence "does not positively prove that married life discourages death, crime, insanity, and pauperism"!) A good deal of this information is useful and well set out, but a considerable shortening both of the tables and discussion could be made without loss. For instance, having pointed out once the fallacy, due to differing age distributions, of comparing the percentage married at ages 15-24 in two populations, it is waste of time to continue to present statistics of this type, *e.g.* for racial groups, and then elaborately to explain the differences found. The first example shows that the age grouping is unsuitable and should, therefore, be abandoned. The book is, however, well summarized

both at its conclusion and at the end of most chapters, so that those who do not want to make a detailed study can gather their information at little cost. Professor Ogburn concludes with a very reasonable plea for further study of the normal family (and not only of the pathological type through the medium of the divorce court), and adds a questionnaire by which he hopes such a study may be made. This questionnaire method of investigation seems very much to the fore nowadays, and it is sincerely to be hoped that it is at its zenith. It is inexplicable to anyone who knows the difficulties involved in obtaining replies, even to the simplest questions, from quite reasonably intelligent people, how it is believed that any material of value will be secured by the issue of these elaborate forms to a long-suffering populace. What on earth is the wife or husband to reply to questions 11, 12, and 13—"What was the crisis of your marriage adjustments, what was its cause and how did you meet it?" Is it of any value to secure a layman's opinion as to whether birth control has damaged his health, or to know whom the wife thought was to blame if she and her husband have "had trouble because of relatives"? And so on, in this case, to fifty questions. Vital statistics constantly cannot tell us all we want to know, but information derived from this type of form will certainly not fill in any of the gaps. Rather it can only result in bringing ridicule upon a method of enquiry that is valid only as long as it is used with very considerable caution and restraint. A. B. H.

6.—*The Board of Trade.* By Sir Hubert Llewellyn Smith. Crown 8vo. 288 pp. London: Putnam. 1928. Price 7s. 6d.

All who know the author of this volume will know, too, that no one could deal with his great and fascinating subject with superior authority. To do justice to the topic and to the treatment it receives in the modest volume in the Whitehall Series in which it is handled would need much more space than our *Journal* is in the habit of devoting to even the most completely statistical treatises. The development of the Board of Trade, our Ministry of Commerce and Industry, from its beginnings in the early seventeenth century to the present time is traced in a series of chapters that are a monument to the skill of their author and are calculated to hold the attention of the reader.

In this place it is to the chapter dealing with the statistical work of the Board of Trade that the reviewer must confine his references, and it is natural to find that the importance of that work is fully recognized by the author of the volume. "From very early times the collection of trade statistics had been one of the functions of the Board of Trade," he tells us, but it was not till 1832 that, under G. R. Porter, an effective organization for statistical purposes was created. The date is significant. It can hardly be a matter of pure accident that the Statistical Societies of Manchester and London were founded in the two years following so notable a step on the part of the Board of Trade, and the eminent statistician called in to put in order the mass of figures in Parlia-

mentary reports and papers was among the founders of our Society.

We need not recite here the titles of the principal series of statistical publications of the Board and the dates of their commencement. The place occupied by statistics in the work of the Board from time to time is in some measure indicated by the changing affiliations of its statistical organization. After forty years, the statistical department was joined with the commercial department, the latter having lost an important part of its work relating to Treaties of Commerce. Though Giffen, made head of this joint department in 1876, was a believer, not only in the grouping of all the statistical work of the Board of Trade in one department, but of the gathering together of all the statistical work of the Government into one Central Department, the separate organization of statistics within the Board was not resumed until 1918. Meanwhile, in 1886, a beginning was made with the collection of Statistics of Labour, the organization of which, as a third element in the joint department already named, was developed further from 1893. This work had passed from the Board of Trade before the present Statistical Department was given separate existence.

From the statistical standpoint, perhaps the feature of greatest moment in the historical sketch of the work of the Board of Trade in this field is, not the development of statistics relating directly to matters with the administration of which the Board was concerned, but the setting-up under Porter and the development under Giffen of the collection by the Board of Trade of statistics which dealt also with the work of other administrative departments, and their publication in convenient summarized form in the series of Statistical Abstracts.

In addition to a description of the classes of work done by the chief divisions of the Board of Trade organization, the volume contains, in appendices, some material of very great interest in the shape of copies of the earliest extant Report of the Board of Trade, the Instructions for the Council of Trade appointed in 1660 by Charles II, and to the Board of Trade appointed in 1696 by William III, and Gladstone's memorandum on the business of the Board of Trade written in 1845 for the use of his successor in the office of President. In addition there are lists of the Presidents and Secretaries, from those of the Councils of Trade during 1622-96, of William III's Board of Trade, 1696-1782, and the Committee of Council for Trade and Plantations to those who have held office under the present organization since 1786.

A. W. F.

7.—*A History of Prices and of the State of the Circulation from 1792 to 1856.* By Thomas Tooke, F.R.S., and William Newmarch, F.R.S. 4 vols. London: P. S. King and Son, Ltd. 1928. Price £4 4s.

8.—*An Introduction to Tooke and Newmarch's A History of Prices, etc.* By T. E. Gregory, D.Sc., Professor of Banking and Currency

in the University of London. 120 pp. London: P. S. King and Son, Ltd. 1928. Price 2s. 6d. net.

It was a pious and commendable act on the part of Messrs. King and Son to reprint an indispensable work which for many years has been only with difficulty available to the student of economic history. For this service statisticians and historians alike are under a debt of gratitude to them. The utility of their work has been enhanced by an admirable introduction by Professor Gregory (also published separately) which will guide the reader through the tangled mass of controversial matter contained in the original six volumes (now bound in four). The authors were "magnificent controversialists" — "historians with a purpose, and that purpose was to pursue, and if possible to destroy, the economic theses to which they were opposed." This is not the place to discuss the rival theories of monetary policy round which fierce disputes raged in the first half of the nineteenth century, disputes in which Tooke and Newmarch were neither always consistent nor always right. As Professor Gregory says, their volumes are not impartial and "may more fully be described as the first systematic utilization by economists of historical material for the establishment of economic truth."

In the attempt to determine how far prices were affected by currency changes or by other factors, Tooke and his collaborators collected a vast amount of data in which the student of to-day may still dig with profit. Professor Gregory discusses in a clear and succinct manner Tooke's views on the causes of price changes, the rate of interest, the effects of a depreciated currency, the policy of the Bank of England, and the development of banking policy, and relates them not only to the problems of his day but to more modern theories. The formal similarity of the situation following the Napoleonic Wars to that in which we still are to-day after the European War is striking. "The two periods," says Professor Gregory, "illumine one another, and we can pass from the depreciated exchanges of 1797-1819 to those of 1914-25, or from the controversies preceding the passing of the Bank Act of 1844 to the question of the amalgamation of the Bank of England and Currency Note issues, or back from these latter-day questions to those earlier ones, with the feeling that our comprehension of the past and present is increasing by comparing one with the other." With this statement one may heartily agree, but with the proviso that the comparison must extend no less to the differences in economic structure to-day from that of a hundred years ago than to the likeness of the monetary problems at both dates.

H. W. M.

9.—*Select Statutes, Documents and Reports relating to British Banking, 1832-1928.* Selected with an Introduction by T. E. Gregory, Sir E. Cassel Professor of Banking and Currency in the University of London. Vol. I, 1832-44, lx + 147 pp. Vol. II, 1847-1928, viii + 391 pp. Oxford University Press, 1929. Price 21s. net, or, separately, Vol. I, 10s. 6d. net; Vol. II, 12s. 6d. net.

These two volumes place in the hands of students of finance in

convenient form a vast amount of information which hitherto they have had to disinter from a mass of irrelevant stuff enshrined in the Reports of Parliamentary Committees and only to be consulted in Public Libraries. With Professor Cannan's edition of the Report of the Bullion Committee, the new edition of Tooke and Newmarch referred to above, and the present volumes, we have now the material for a complete study of the financial, and especially the banking, problems of the last hundred years or so, and the Introductions by Professor Gregory to the two last-named works blaze the way for the student through thickets and forests that are often thorny and intricate. The statistician who wishes to analyse the vast collections of figures relating to banking which are contained in a series of Blue Books coming down to 1878 will do well to acquaint himself first with the history of the economic problems that are attached to those figures.

Professor Gregory begins his selection of documents with extracts from the Bank Charter Enquiry of 1832 and the Select Committee on Banks of Issue of 1840, and official correspondence leading up to the Bank Charter Act of 1844. Next come documents relating to the crisis of 1847 and the parliamentary enquiries of the following year into commercial distress. The end of the Usury Acts in 1854 is then chronicled. The 1857 crisis brought another Select Committee to enquire into the Bank Acts, and seventy-four pages are devoted to extracts from the evidence and the Report. The Overend Gurney crisis of 1866, the Baring crisis of 1890, and the American crisis of 1907 did not give rise to any public enquiries, but the nature of each crisis and the lessons to be drawn from it are illustrated by copious extracts from *The Times* and *The Economist*.

So far the collection of documents in 218 pages has dealt with the history of the Bank of England. Part III in 89 pages treats of Joint Stock Banking, beginning with the 1836 Report of the Secret Committee of the House of Commons, reproducing the legislation of 1844-62, and giving extracts from the evidence taken in 1875 before the Select Committee of the House of Commons on Banks of Issue. The City of Glasgow Bank scandal of 1878 raised in an acute form the question of unlimited liability of Bank shareholders, extracts are given from *The Economist*, and the Act of 1879 extending the privilege of limited liability to banks is reprinted.

By the opening of the present century all the old fierce controversies had been settled by the progress of time and the slow development of banking technique. The reproduction of an Interview in 1910 between the Governor and Directors of the Bank of England and the National Monetary Commission of the United States shows the Bank in its true position as a Central Bank, the final custodian of credit. The European War and its aftermath brought a new series of problems, and in the final section devoted to these we have the Currency Notes Acts of 1914, the Report of the Treasury Committee on Bank Amalgamations, the Reports of the Cunliffe Committee in 1918 and 1919, the Treasury Minute of 1919 on the circulation of currency notes, the Report of the Committee on

the Currency and Bank of England Notes Issues in 1925, the Gold Standard Act of the same year, and, finally, the Currency and Bank Notes Act of 1928.

The old disputes are mostly dead or of academic interest only, but new problems have arisen out of the burdens inherited from the war and out of the new international distribution of financial power. Controversies about the nature of credit and its control, about the stabilization of prices by bank action, and about the character of the monetary standard have not been absent from the recent past. They will become more acute in the immediate future, but if it is finally determined that there should be changes in our financial organization, it is imperative that these should be in organic development from the experience of the past. Knowledge of the history of the growth of that organization will be indispensable, and Professor Gregory and the Oxford University Press are to be congratulated on the timely production of a compilation which no economist dare omit from his bookshelves.

H. W. M.

10.—*The Railway Policy of South Africa.* By S. Herbert Frankel, M.A. (S.A.), Ph.D. (London), Senior Lecturer in Economics and Economic History in the University of the Witwatersrand, Johannesburg. xvii + 367 pp. Johannesburg: Hortons Ltd. 1928. Price 15s.

This book is the outcome of a request to Dr. Frankel by the Gold Producers' Committee of the Transvaal Chamber of Mines to conduct a scientific investigation into "Railway Rates in the Union, with particular reference to the general rates policy adopted by the Railway Administration and its effect on the primary industries and on the development of the country generally." It deals with (1) the provisions of the South Africa Act, 1909, (2) railway policy and finance, (3) railway rates, and (4) the effect of the railway rate policy on the industries of the Union. The book also contains numerous statistical tables and appendices.

The South Africa Act, 1909, stipulates that the railways shall be administered on business principles. Dr. Frankel contends that not only has the Railway Board frequently sanctioned practices which cannot possibly be defended on business principles, but that it has directly violated the responsibility placed upon it by the Act, and he makes the statement that

"Instead of a strong body initiating and consistently applying a business policy under which the railways are managed in the interests of the whole country, the Railway Board is merely the tool of the Government, not even checking a policy very frequently based on merely political and party considerations."

The author supports these views on the grounds that (1) the railways are burdened with perpetual excess interest payments to the Treasury, (2) the operations of the Renewals Fund have been dictated primarily by considerations of financial expediency, (3) the outworn financial system under which the Administration is forced

to work cramps and stifles the efforts of the officers, (4) non-economic lines have been built for political purposes and necessary capital expenditure on other sections of the railways has been curtailed in consequence, (5) uneconomic white labour has been employed, and (6) free or partly gratuitous services have been rendered by the railways.

In the chapters dealing with the rate policy and its effect on industries, Dr. Frankel criticizes the existing classification of commodities, and maintains that the policy which has been adopted is discriminatory and uneconomic and places a very heavy burden on the gold-mining industry. An addendum to the book contains suggestions for the future control and management of the railways and harbours.

Dr. Frankel severely condemns the policy of the South African Railways, but one does not feel that his book is altogether an unbiassed presentation of the position. Little if anything new is contributed to the solution of the problem of state versus private ownership of railways, although examples are given of some of the evils which may result from state management. At the same time many will agree with Dr. Frankel's suggestion that the future management of the railways in South Africa should be on the lines of the recommendations made (1) by the Royal Commission on Railways and Transportation in Canada (1917) and in the main adopted in the formation of the Canadian National Railways, and (2) by the late Sir William Acworth and M. Lèverve in the General Report on the Future Administration of the German Railways. Support will also be forthcoming for the suggestion that the establishment of a Railway Rates Tribunal for South African Railways is desirable.

The arrangement of the book is unusual, and the notes and references are not conveniently placed.

A. F. K.

11.—*The Problem of Motor Transport.* By Christopher T. Brunner, M.A. 187 pp. London: Benn. 1928. Price 12s. 6d. net.

Mr. Brunner's book on Road Transport may be regarded as complementary to Mr. Sherrington's two volumes on Railway Transport. It covers less time and less ground, because motor transport is itself so modern; but it is new ground, and no other book, we think, deals with the whole subject so completely. In the early part of his book Mr. Brunner describes the legislation affecting road vehicles. At first there were severe restrictions on weight and speed; these were gradually relaxed; on the other hand, taxation was gradually increased. No doubt there will always be a conflict of opinion between those responsible for road maintenance, who wish the vehicles to fit their roads, and the road-users who want the roads to fit their vehicles. Taxation may be said to have begun with the Finance Act of 1909-10; in 1920 the petrol duty was abolished (to be renewed in 1928) and new scales of taxation were introduced. Now we have three principles in use: (1) a tax on nominal horse-power for private cars, (2) a tax on unladen weight

for commercial vehicles, and (3) a tax on seating capacity for passenger vehicles or "hackneys." Mr. Brunner does not quote the actual scales now in force, and he has nothing to say about the extraordinary anomalies which the scales reveal. Thus a $7\frac{1}{4}$ -ton lorry pays no more than a 5-ton lorry; the showman gets off more cheaply than the manufacturer or merchant; the farmer reaches his maximum tax at 2 tons.

Mr. Brunner has to admit that there are no adequate statistics to show the work done by road transport, but he gives his own estimate of the persons engaged in the motor industry—250,000 in 1927, earning wages of one million a week; he reckons that there are 800,000 persons employed directly and indirectly. He speaks of "the low wages and long hours obtaining in certain sections of the road transport industry," though other men are well paid; he contrasts this with the "very favourable wage settlement" gained by railwaymen in 1919. But he is quite wrong in saying that the shareholders were placed in a privileged position by the Railways Act of 1921, or that they were guaranteed a standard revenue. Dealing with the rival forms of transport he says clearly that roads and railways are not complementary but competitive.

Of late years the private car has grown lighter in weight, while the commercial vehicle has grown heavier. Mr. Brunner thinks that the steam vehicle is by no means obsolete, although hit by the low price of petrol; $27\frac{1}{2}$ per cent. of the vehicles above 4 tons are steam-driven. One advantage of the steam vehicle is that it can draw three trailers, and thus suggests "a railway train let loose." It can take bulky loads for long distances at a slow speed, but it is smoky, noisy and dirty. Mr. Brunner gives a surprising estimate of the unemployment (10 to 15 per cent.) in an industry which has been growing steadily; he puts it down to want of organization. He believes that the great extension of ownership of motors "makes co-ordination of road and rail transport much more difficult." A function is still left for the horse-drawn vehicle, *i.e.* door-to-door delivery within a small radius for such things as bread, milk, and coal. Mr. Brunner complains that the horse vehicle is practically tax-free; he wants to impose an adequate tax, "especially for heavy horse traffic," partly because horses take up space in the street, cause congestion, and check the speed of the traffic stream.

Road-making problems are fairly discussed in view of the special difficulties introduced by the rubber tyre and its suction effect. Mr. Brunner favours tar-macadam or bituminous macadam, not concrete, except for side streets in industrial towns. He admits frankly that street accidents are part of the cost of motor traffic, and he notes that the "waste of life and limb from motor accidents is increasing." There are from five to six accidents a year per 100 vehicles, and of these 5 per cent. prove fatal. Road expenditure has grown since 1910 from £15 million to £50 million. Mr. Brunner thinks that motor owners should only pay the difference between these two figures. But there are other costs—police, damage to adjoining property, accident cases at hospitals. Mr. Brunner does

not deal with the question whether motorists should pay for the use of the roads as well as for the damage they cause. Mr Brunner thinks that light vehicles cause little damage, but he does not draw the natural inference that the heavier vehicles should be more heavily taxed and that stricter limits should be placed on their weight and speed.

J E A

12—Other New Publications¹

Balderston (C Canby) Managerial Profit Sharing (University of Pennsylvania) 127 pp Philadelphia 1928

[A study of the methods and extent of profit sharing with managers and executive officers in industrial and other concerns, situated mainly in the United States. It is based on a survey of numerous American and foreign profit sharing schemes, sixty five of which came within the scope of this thesis. The details of their working are tabulated in two divisions namely, those who gave the information for publication and those who received their schemes in confidence, the latter firms being referred to by numbers. On the whole the various schemes are considered to have been successful in improving the quality and quantity of the work of those participating in them. A bibliography is appended and the book is indexed.]

Banerjee (Prathamath), M A (Cal), D Sc Econ (Lond) Minto Professor of Economics Calcutta University Indian Finance in the Days of the Company 1 + 392 pp London Published for the University of Calcutta by Macmillan, 1928 Price 12s 6d

[On the basis of the ordinary official publications and the manuscript records of the Governments of India and Bengal, Professor Banerjee has attempted to deal with 'the most important aspects of Indian public finance of the period 1765 to 1858'. The various changes that took place in the financial system of the East India Company from the early days when their lands in India were regarded as private property, through the stages by which the Crown established itself as sovereign in India and acknowledged at the same time some responsibility towards the people whose welfare largely depended on the actions of the Company's officials are discussed with scientific coldness, and the author freely permits himself an expression of censure on the manifold anomalies, the many and meaningless alterations in practice, the not infrequent dishonesties and injustices. After general description of the development of what he generously calls 'the financial system', a chapter is given to discussing debts and surplus. Finance and Revenue occupies one chapter and 'Other Heads of Revenue' another, while successive chapters are given to civil expenditure and military expenditure. A series of appendices contain the chief figures relating to revenue, expenditure, surpluses, deficits, cash balances, etc.]

Burster (H) Elementary Applications of Statistical Method. 57 pp London and Glasgow Blackie, 1929 Price 3s 6d

[This little manual, which the author states at the outset is 'not a work on statistics,' is intended as a guide for those who, not being statisticians, have nevertheless to handle statistical data. In six chapters the author deals with tabulation of data, frequency distributions, goodness of fit, representative measures, measures of dispersion, significance of the mean and of the difference between the means of two samples and correlation. The supplementary matter consists of examples of graphs, a list of symbols, formulæ, logarithmic tables, and answers to the

¹ See also 'Additions to the Library' p 305, *et seq*

exercises which follow each chapter; and the work is completed by a brief but adequate index. The fact that Mr. Udny Yule was one of those to whom the MS. was submitted before publication should indicate the soundness of the instruction offered.]

Camden Miscellany, Vol. XV. (Camden Third Series, Vol. XLI.) London: Royal Historical Society, 1929.

[This volume contains six papers, each embodying edited reprints of old documents, certain of which contain matter of interest to the economic historian. The most important in this respect is *Select Tracts and Table Books* relating to English Weights and Measures (1100-1742), ably edited by Hubert Hall and Frieda J. Nicholas, with an introduction and a "glossarial index" of metrological and economic terms. The other contents of the book are: A Transcript of "The Red Book," a detailed account of the Hereford Bishopric Estates in the Thirteenth Century; Edward II, the Lords Ordainers and Piers Gaveston's Jewels and Horses (1312-13); Table of Canterbury Archbishopric Charters; An Early Admiralty Case (1361); and An English Prisoner in Paris during the Terror (1793-94).]

Deushurst (J. Frederic). *Employment Fluctuations in Pennsylvania, 1921 to 1927*. (University of Pennsylvania.) 192 pp. Philadelphia, 1928.

[A study based on monthly statistics of employment and wages in the principal manufacturing industries in Pennsylvania during the past seven years, the data for which were compiled at the instigation of the Federal Reserve Bank of Philadelphia as a guide to the determination of its credit policy in accordance with the needs of local commerce and industry. After describing the methods used in collecting the data and constructing the index-numbers the author analyses the fluctuation of employment and wages in relation to financial, industrial, and other conditions. Tables of index-numbers and of figures of employment and wage rates are given in an appendix.]

Fisher (Irving), assisted by *H. Bruce Brougham*. *Prohibition still at its worst*. xxvii + 358 pp. New York: Alcohol Information Committee, 1928. Price \$1.50.

[A sequel to the author's book *Prohibition at its Worst*, published in 1926, and reviewed in Part II of the *Journal* for 1927 (p. 808). One of the criticisms of that book was that no attempt had been made to summarize the evidence of those opposed to prohibition, and in order to remedy the omission, an outline of the present work was sent before publication to representative bodies on both sides, with a request for their views, which the author has endeavoured to present impartially. His own conclusions are given in the final chapter.]

Jathar (G. B.), and *Bei (S. G.)*. *Indian Economics*. Vol. I. xii + 497 pp. Bombay: Taraporevala Sons & Co., 1928. Price Rs. 4.8.

[In this book, intended for Honours Students reading for the B.A. and M.A. degrees in economics, the intention has been to give an adequate treatment within a reasonable compass of the principal economic problems of India. It should be of interest to all who desire to understand the pressing economic problems of the country. This volume is chiefly devoted to the study of agricultural and rural problems, but is to be followed by a second, which will presumably deal with the financial and industrial aspects of the subject. It is to be hoped that an index to both volumes will be included.]

Jones (W. A. Stewart). Economics of the Manufacturing Business. 154 pp. London: Pitman, 1928. Price 3s. 6d.

[In this book, described by the author as "an attempt to present a brief but systematic survey of the organization of a modern manufacturing concern," the mechanism of a large-scale industry is sketched out and then dissected into its component parts. The examination begins with the financial promotion of an undertaking and its possible forms, proceeds to the ramifications of management, and thence to the detailed working of the several departments—correspondence and filing, book-keeping, buying, stocktaking, wages, costing, sales—while the two last chapters deal respectively with works regulations and the execution of an order. Specimen forms for use in costing, wages calculations, etc. are given, and a test paper is appended to each chapter. The book is primarily intended for commerce degree students. It is indexed, but not well indexed.]

Netherlands and the World War (Studies in the War History of a Neutral, Volume IV). x + 226 pp. New Haven, Conn.: Yale University Press; London: H. Milford, 1928. Price 14s.

Nolde (Baron Boris E.). Russia in the Economic War. xv + 232 pp. New Haven, Conn.: Yale University Press; London: H. Milford, 1928. Price 11s. 6d.

[These two publications belong to the valuable series, the "Economic and Social History of the World War," issued by the Carnegie Endowment for International Peace with the aim of bringing together the material for measuring the full economic cost of the war. The volume relating to the Netherlands consists of two monographs. In the first, "The Effect of the War upon Banking and Currency," Drs. G. Vissering and J. Westermann Holstijn, the President and a director, respectively, of the Netherlands Bank, under the headings of the Money Market, the Banks, and the Foreign Exchanges, have traced the monetary history of their country from 1914 down to 1922. The first section falls naturally into three divisions, dealing in turn with: the emergency measures taken at the beginning of the war; the situation created during the war by the plethora of money, and the credits to foreign countries; the situation after the war. The account is amply supported by statistical data, and the chapter on Foreign Exchanges includes a table showing the monthly figures of the principal rates at Amsterdam from 1914 to 1922, and a review of the foreign exchange policy of the Netherlands Bank.

In the second study, "War Finances in the Netherlands," 1918-22, by Professor Dr. H. W. C. Bordewyk, the statistics of shipping, trade, industry, agriculture, prices, public debt, and taxation furnish the text for a very instructive analysis of the economic consequences to the nation of the war conditions and of the sudden financial changes which followed the peace. The final chapter is devoted to conditions in the Dutch overseas possessions.

Baron Nolde's book is a historical and political record rather than an economic study, with the exception of Chapter VII, which consists of a brief but statistically documented account of the foreign trade of Russia during the war. The remainder of the volume is a very detailed chronological description of economic policy, legal enactments, naval and financial blockading, the embargo and tariff war, ending with the Brest-Litovsk attempt at an economic peace in 1917.]

Peddle (J. Taylor). The Invariable Standard and Measure of Value. 254 pp. London : P. S. King, 1928. Price 7s. 6d.

[The Aladdin's lamp which is to illuminate the dismal science of political economy and transmute all economic evil into good is the foundation of economic theory and the fixing of prices and values on a basis of "productive power." This is the "invariable standard and measure of value," which furnishes the title of the book and the heading of two of its chapters. Prices are to be stabilized on the basis of "money's worth," i.e. "The price value of every commodity should be determined by its cost of production, that is, labour services." "The £1 note should measure the worth of purchasing over the mass of production"; and the "basis of the quantity of money" is to be the Bill of Exchange. A great deal of the book is occupied, as in the author's former works, with denunciations of the gold standard, and of all standard economic theories and "orthodox economists," past and present. Three consecutive chapters consist of "Aphorisms" from the respective works of Adam Smith, Ricardo, and List, it being pointed out that the "advantages derived from publication . . . in the condensed form" are an "extraordinary confirmation" of the author's theory, and a "clear demonstration" that "the present Free Trade gold standard has no solid basis in history or in fact." Mr. Peddle adds, in the most natural and engaging manner : "the aphorisms with which I agree are those that are related to a political economy based on productive power, but I disagree with those that are related to a political economy based on gold and silver."]

Robertson (Rt. Hon. J. M.). The Political Economy of Free Trade. ix + 190 pp. London : P. S. King & Sons, 1928. Price 8s. 6d.

[A vigorous defence of free trade, stimulated by the present tendencies towards protection in this country. The author summarizes the history of Protection in its various guises from the Middle Ages onwards, and endeavours to show the relations of modern economic developments to the departure from this principle, and to analyse the effects of recent protective legislation. An index would have been an advantage.]

Spalding (William F.). Foreign Exchange and Foreign Bills in Theory and in Practice. 7th ed. xiv + 305 pp. London : Pitman, 1928. Price 7s. 6d.

[The first edition of this book was reviewed at length in the *Journal* for May 1916, and some of the later editions have since been briefly noticed. In this present edition a considerable portion has had to be rewritten owing to the stabilization of the currencies of various countries. Certain chapters relating to the war and the foreign exchanges have, however, been retained, and other material relating to the war period is reprinted in an appendix.]

Vakil (C. N.), and *Muranjan (L. K.)*. Currency and Prices in India. xvi + 549 pp. Bombay and London : P. S. King, 1927. Price 18s.

[A historical survey of the causes of changes in prices of commodities and the general price level in India and of the influences thereon of the currency systems and their changes. The book opens with history of Indian currency from 1806 to 1920, in course of which the author describes the difficulties due to the silver standard, the demand for a gold currency, its rejection by the Government in 1874, and the subsequent adoption of the gold exchange standard. The next section deals with prices in great detail; it includes a study of the price-trends of important commodities during the past sixty years and a description of Indian index-numbers, with certain criticisms of their method of construction. The remainder of the book is devoted to a discussion of the issues raised by the currency commission.]

CURRENT NOTES.

The overseas trade of the United Kingdom showed a remarkable increase both in imports and exports (as measured by value) in January of this year as compared with a year ago, but this movement was not continued in February and March. The alteration in these last two months was probably in large degree due to the inclemency of the weather, which detrimentally affected transport and all outdoor operations, and the inclusion of part of the Easter holidays in March this year was a minor factor. Comparing the first quarters of 1928 and 1929, the gross imports in the first quarter of this year were 1.2 per cent. less in value than those in the corresponding quarter of last year, but net imports decreased by only 0.2 per cent. Exports of British merchandise showed a decline of only 0.4 per cent. in value. Looking at some of the leading classes of British exports, it is of special interest to find that exports of coal increased from 12,023,000 tons in the first quarter of 1928 to 13,126,000 tons in the first quarter of 1929, and that exports of coke and briquettes registered an increase from 859,000 tons to 1,096,000 tons. Exports of iron and steel and manufactures thereof also showed a growth from 1,059,000 tons to 1,151,000 tons, which was the more satisfactory considering that retained imports of the same classes of goods decreased from 840,000 tons to 584,000 tons. There was a small reduction in exports of machinery, but substantial increases in exports of motor-cars and chassis, motor cycles, other cycles, locomotives, and ships and boats. In textile exports there was little change in the cotton trade, the decreases in quantities of cotton yarns and piece-goods being respectively only 1.6 and 1.1 per cent., but the situation as regards manufactures of wool was more unfavourable, reductions being registered of 10.2 per cent. in tops, of 15.3 per cent. in yarns, and of 2.8 per cent. in woollen and worsted tissues. In the chemical group there was a large increase in exports of ammonium sulphate (from 78,000 tons to 119,000 tons) and a large decrease in exports of sodium compounds (from 118,300 tons to 95,600 tons), while moderate increases were shown in exports of copper sulphate, coal-tar dyestuffs, and paints. Exports of cement rose by about a fifth, and there were satisfactory increases in exports of pottery and tiles, of glass bottles, and of paper, while reductions were registered in leather, boots and shoes, hosiery, hats, linoleum, and oilcloth.

Movements and Classes.	Twelve Months ending March, 1928.	Twelve Months ending March, 1929.	Increase (+) or Decrease (—).
Imports, c.i.f.—	£'000.	£'000.	£'000.
Food, drink, and tobacco	541,302	531,440	— 9,862
Raw materials and articles mainly un- manufactured	343,735	333,333	— 10,402
Articles wholly or mainly manufac- tured ...	316,556	314,894	— 1,662
Other articles ...	5,576	13,485	-- 7,909
Total Imports ...	1,207,169	1,193,152	— 14,017
Exports, f.o.b.—			
<i>United Kingdom Produce and Manufactures—</i>			
Food, drink, and tobacco	53,072	53,339	+ 267
Raw materials and articles mainly un- manufactured	74,341	70,887	— 3,454
Articles wholly or mainly manufac- tured ...	576,764	576,507	— 167
Other articles ...	16,368	21,836	+ 5,468
<i>Imported Merchandise—</i>			
Food, drink, and tobacco	26,452	27,263	+ 811
Raw materials and articles mainly un- manufactured	72,907	63,166	— 9,741
Articles wholly or mainly manufac- tured ...	25,216	26,466	+ 1,250
Other articles ...	177	316	+ 139
Total Exports ...	845,297	839,870	— 5,427
Bullion and Specie—			
Imports ...	39,432	59,973	+ 20,541
Exports ...	49,203	59,748	+ 10,545

Movements of Shipping in the Foreign Trade—	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	33,093	40,314	31,478	39,911	— 1,615	— 403
Foreign ...	26,597	19,864	24,909	20,006	— 1,688	+ 232
Total entered ...	59,690	60,178	56,387	60,007	— 3,303	— 171
<i>Cleared with cargoes—</i>						
British ...	38,035	42,588	38,502	43,350	+ 467	+ 762
Foreign ...	21,966	21,072	21,757	21,526	— 209	+ 454
Total cleared ...	60,001	63,660	60,259	64,876	+ 258	+ 1,216

Turning to retained imports of raw materials, increases were shown in the first quarter of 1929 compared with the first quarter of 1928 in phosphate of lime, iron ore, iron pyrites, and pig and sheet lead, but there were reductions in tin ores and semi-manufactured copper and tin, and in crude zinc. Hard wood showed a reduction of about 12 per cent. and pit props of about 13 per cent., but soft wood increased by about 9 per cent. Retained imports of raw cotton showed an exceptional rise from 347 million lbs. to 497 million lbs. and were far above the quarterly average for 1928 (360 million lbs.). Retained imports of sheep's and lambs' wool, on the other hand, were down from 240 million lbs. to 183 million lbs., but most of the reduction took place in March and was probably due to the unwillingness of importers to buy on account of the uncertain price situation. There was a heavy decrease in retained imports of flax and moderate reductions in those of hemp and jute, but the supplies for the silk trade were much the same as a year ago. Raw materials for the oil-seed crushing and refining trade were on the whole in greater supply last quarter than a year earlier and there was a very large increase (39.4 per cent.) in imports of wood pulp, but there was a substantial falling-off in imports of hides, skins, and leather. Retained imports of the chief kinds of food-stuffs were generally somewhat less in the first quarter of 1929 than in the first quarter of 1928, but conspicuous exceptions are to be found in maize, cheese, apples, raw sugar, and tea.

The *Board of Trade Journal* for 25 April, 1929, compares the export and import trade of the first quarter of 1929 with that of the first quarter of 1924 on the basis of the prices ruling in the earlier period. The following table summarizes the particulars for the first quarter of each of the last two years :—

Trade of First Quarter 1928 and 1929.

Class of Trade.					Declared Value.	Estimated at Prices of 1921.	Trade of 1921. Declared Value.
Imports: 1928					£ mill.	£ mill.	£ mill.
1929					309.7	344.4	301.6
British Exports: 1928					306.0	349.0	
1929					181.9	209.5	194.7
Re-exports: 1928					181.2	212.6	
1929					33.2	31.8	30.2
					30.1	30.0	

The volume of imports was 14.2 per cent. greater in the first quarter of 1928 and 15.7 per cent. greater in the first quarter of 1929 than in the first quarter of 1924, and similarly British exports showed

increases of 7·6 and 9·2 per cent. in the two quarters respectively. On the other hand, exports of imported goods were less than in the first quarter of 1924 by 18·9 per cent. in the first quarter of 1928 and by 23·6 per cent. in the first quarter of 1929. The fall in the average value of imports, which was 10·1 per cent. in the first quarter of 1928, was 12·3 per cent. a year later, and the fall in the average value of British exports moved from 13·1 per cent. to 14·8 per cent. The average value of re-exported goods, which was 4·4 per cent. greater in the first quarter of 1928 than in the first quarter of 1924, was in the first quarter of 1929 only 0·3 per cent. greater, the reduction being mainly due to the lower price of rubber. Retained imports of raw materials and articles mainly unmanufactured were in the first quarter of 1929 about 23·6 per cent. greater in volume than similar imports in the first quarter of 1924 and about 11·7 per cent. greater than similar imports in the first quarter of 1928. Among exports of British produce and manufactures the class of articles wholly or mainly manufactured showed in the first quarter of 1929 an increase of about 14 per cent. in volume above that of similar exports in the first quarter of 1924, but they were only 0·8 per cent. greater than a year ago. Exports of raw materials and articles mainly unmanufactured (chiefly coal and wool) during the past quarter were 5·7 per cent. greater in volume than a year ago, but 10·2 per cent. less than in the first quarter of 1924. Finally, it should be remembered that the volume of retained imports of raw materials in the first quarter of the year has varied considerably from year to year, principally on account of changes in the quantities of textile materials brought forward in that quarter.

The United States Department of Commerce in their Report on Foreign Trade of the United States in the calendar year 1928 (Trade Information Bulletin No. 602) have at last followed the example set by the Board of Trade in their reviews of British trade statistics and produced estimates of the volume and value of the import and of the export trade of the United States over a series of years. Two bases are taken, 1913 and the average of the years 1923-5, and on each of these index-numbers are calculated showing the movements of the quantity and of the prices of exports of United States merchandise and of general imports. Taking the average quantity of exports in 1923-5 as 100, the figure for 1926 was 115, that for 1927 was 124, and that for 1928 was 130; on the basis of the average imports for 1923-5 being 100, the quantity was 110 in 1926, and rose to 112 in 1927 and to 113 in 1928. The price change of exports was to 92 in 1926 and to 86 in 1927 and in 1928; the price change of imports was to 104 in 1926, to 96 in 1927, and to 94 in 1928. Taking 1913 as base, exports

in 1928 showed a rise of 65 per cent. in quantity and of 25 per cent. in price, while imports increased by 81 per cent. in quantity and by 26 per cent. in price. These new calculations add considerably to our knowledge of the external trade of the United States.

Another section of the same Report deals statistically and graphically with the relation of exports to production at different periods. In 1914 only 9.7 per cent. of the total production of exportable goods was exported; during the war there was, naturally, a considerable increase, but the percentage fell to 8.7 in 1923, rising to 9.9 in 1925, and falling again to 9.6 in 1927. Taking manufactured goods alone, the percentage exported in 1914 was between 9.3 and 10.0; in 1927 it was only between 7.7 and 8.0. In manufactured food-stuffs the percentage fell from between 8.6 and 10.0 in 1914 to between 5.0 and 5.5 in 1927; the exports of other manufactured goods fell from between 9.5 and 10.1 to between 8.4 and 8.7. The exports of manufactures other than food-stuffs have "substantially, if not quite quadrupled" in "quantitative volume" since the beginning of the century, but "the enormous expansion in the domestic market for manufactured products has brought it about that the exports of non-food manufactures represent only a slightly greater proportion of the total output at present than at the beginning of the century and an appreciably smaller proportion than in 1924."

As measured at the Board of Trade, the general average of wholesale prices in January was 0.1 per cent. higher than in December, the index-numbers for the two months being 83.2 and 83.1 respectively (1924 = 100). Food was cheaper on the average by 0.4 per cent., while industrial materials were dearer by 0.4 per cent. Average prices during the month of February showed a further slight increase of 0.1 per cent., making the index figure 83.3, but on this occasion it was food prices which on the average increased by 0.8 per cent., while industrial materials were cheaper by 0.4 per cent. For the first two months of the year, therefore, this index-number maintained the steadiness which characterized it in the last four months of 1928. For the six months, September to February, the average index-number was 83.1, the indices for these months varying only between 82.8 and 83.3. Taking the average for 1913 as 100, the index for all articles for February was 138.4, the figures for the 53 articles of food and for the 97 industrial materials being 148.7 and 132.7 respectively. For the smaller groups the indices ranged from 112.6 for iron and steel, to 160.4 for food-stuffs other than cereals, meat and fish.

According to the *Economist* index-number of wholesale prices, the general level at the end of January was about 0.3 per cent. below that at the end of 1928, and was measured, according to the new basis of this index-number in which prices for 1927 = 100, by an index of 94.7. This slight change was the result of lower prices for food, textiles and "miscellaneous" materials which more than offset a rise in the minerals group. During February the general level moved upwards, so that by the end of that month this index-number recorded a rise of approximately 1 per cent., carrying the total index to 95.6, as compared with 98.5 a year before. This increase was caused in the main by higher values for cereals and meat; the figure for minerals also showed an increase, whereas textiles and foods other than cereals and meat declined. Expressed as a percentage of the average for 1913, the index figure for the end of February was 137.3, the range in the principal groups being from 106.1 for "miscellaneous" to 179.0 for foods other than cereals and meat.

As measured by the *Statist* index-number, movements of wholesale prices in January showed a continuation of a trend towards a lower level of prices. The index-number for the end of January was 117.0, as against 117.9 for the close of December and an average of 120.6 for the year 1928. Up to the end of January, the *Statist* observed that the higher money rates in force both in this country and in the United States of America continued to give to gold prices a downward tendency. It was therefore somewhat paradoxical that the month of February, which witnessed the imposition of a still higher level of money rates in this country, should also witness a rise of wholesale prices, amounting, according to the *Statist*, to 2.6 per cent., and carrying this index-number to 120.1 at the end of the month. The explanation is that seasonal factors nominally exert an upward pull on sterling wholesale prices at this time of the year, and it was their influence which was principally reflected in the rise of the general index-number. Expressed as a percentage of the index-number at the end of June, 1914, that for the end of February was 144.1, an average in which the smallest increase was shown by minerals (131.3), while the greatest increase was shown by textiles (161.4).

According to the returns collected by the Ministry of Labour as to movements of retail prices in Great Britain and Northern Ireland, between January 1 and February 1 there was a decline in the average level of the retail prices of food, due mainly to reductions in the average prices of eggs, bacon, fish, butter and cheese. Expressed as

a percentage of the average prices in July, 1914, the level between the dates mentioned fell from 159 to 156. During February the widespread frost, which restricted the movement of certain food-stuffs into consumption, checked the normal seasonal downward movement and the index rose slightly to 157 on March 1. If account be taken of all the items included in the budget in addition to food, the index of general retail prices which stood at 167 on January 1, fell to 165 a month later and then rose again to 166 on March 1. Since the expenditure on food represents 60 per cent. of the total expenditure in the original budget, it would appear that the level of retail prices other than food remained at approximately 179 in the first two months of the year, the principal items in this average being rent (152), clothing (220) and fuel and light (170 to 175).

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increase for all items covered by the budget in each case, such items, in addition to food, comprising generally, rent, clothing, fuel and light, and other household requirements:—

Country.	Date of latest return.	Food.	All Items.
		Percentage increase	Percentage increase.
<i>Overseas Dominions, etc.</i>			
Australia	January, 1929	61	46 (1st qr. 1928)
Canada	February, 1929	52	57
India (Bombay)*... ..	February, 1929	46	49
Irish Free State	January, 1929	73	77
New Zealand	January, 1929	49	62
South Africa	January, 1929	15	31
<i>Foreign Countries.</i>			
Belgium	January, 1929	—	756
Czechoslovakia (Prague)... ..	December, 1928	805	625
Denmark	January, 1929	47	73
Egypt (Cairo)	November, 1928	51	—
France (Paris)	February, 1929	602	431 (4th qr.)
France (other towns)	November, 1928	462	—
Germany	January, 1929	53	53
Holland (Amsterdam)	December, 1928	—	68
Italy	January, 1929	465	438 (Milan in Dec.)
Norway	January, 1929	58	81
Spain (Madrid)	December, 1928	87	—
Sweden	February, 1929	51	70 (Jan.)
Switzerland	December, 1928	58	62
United States	December, 1928	56	71

* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland, quoted on p. 131 of Part I, 1929, of the *Journal*, the *Labour Gazette* observed during January a steady improvement, which, however, at the end of the month still failed to reach the level of the third week of December, and left the volume of employment generally where it was at the end of November. Employment during February was adversely affected by the severe weather which set in towards the middle of the month and continued till the end of the first week in March. Among the workpeople, numbering approximately 11,880,000, insured against unemployment in Great Britain and Northern Ireland, the percentage unemployed in all industries taken together was 12.3 on January 21, as compared with 11.2 on December 17, 1928. By February 25 the percentage had fallen slightly to 12.2, which compared with 10.4 on February 20, 1928. The total number of applicants for employment registered at Employment Exchanges in Great Britain and Northern Ireland, which was 1,565,000 at the end of 1928, fell to 1,434,000 on January 28, and on February 25 it showed little or no change at 1,430,000, but this number was considerably above that of a year before, when it stood at 1,139,000 on February 27, 1928.

Official statements as to employment in Germany quoted from the *Reichsarbeitsblatt* by the *Labour Gazette* showed that economic decline combined with seasonal influences brought about a further falling off in December in the labour market, and the situation became still worse during January. At the end of December the Employment Exchanges reported 2,545,000 persons as seeking work, as against 1,763,000 a month before, and by the end of January the figure had risen to 2,990,000, and further to 3,019,000 on February 14. Returns from national trade unions with a total membership of nearly 4½ millions showed an increase in the percentage of members unemployed from 9.5 at the end of November to 16.7 at the end of the year, and further to 19.4 at the end of January, as compared with 11.2 at the end of January, 1928. In France excess of offers of employment over applications continued to be the main feature of the general situation, and on March 2 the total number of unemployed persons remaining on the "live register" of the Exchanges remained at a nominal level (12,988). In the case of Norway the trade union percentage of unemployment rose from 14.6 to 15.7 during November, and again to 17.6 at the end of 1928, but the latter figure still compared favourably with that at the end of 1927, viz. 24.5 per cent. In Sweden the comparison with a year before was not so favourable, for the trade union percentage of unemployment at the end of the year at 17.2 was only a little less than the figure of

18.6 at the end of 1927. By the end of January there was a seasonal decline of the rate to 14.8 per cent., which was only a fraction less than the rate for a year before. In the third Scandinavian kingdom returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange showed that out of over 272,000 workpeople, 27.6 per cent. were unemployed on January 31, as against 25 per cent. at the end of the preceding month, and 29.6 per cent. at the end of January, 1928.

In Canada the index-number of employment now rests upon returns received from approximately 6,400 firms employing about one million workpeople, and has as its base the volume of employment during the week ending January 17, 1920. Standing at 116.7 on December 1, this index fell to 109.1 on January 1, and then began the period of seasonal recovery by reaching 110.5 on February 1, a figure which compared well with 102 on February 1, 1928. The monthly report on employment issued by the Federal Department of Labour Statistics at Washington is now based upon returns received from over 23,700 establishments employing over four million workers. On this basis it showed a slight increase of employment during December amounting to 0.5 per cent., but this was followed by an almost equal contraction during January. The index-number of employment which continues to rest upon returns received from nearly 12,000 establishments in 54 of the chief manufacturing industries, and has as its base average monthly employment in 1923, rose from 87.7 in November to 87.8 in December, and fell back slightly to 87.5 for January, the latter figure being, however, 3.9 per cent. above that for the opening month of 1928.

The official statistics of old Turkey were so notoriously unreliable, that the remarkable advances which have characterized statistical effort under the new *régime* are deserving of particular note. Realizing that in statistics lay the foundation of the administrative and legislative branches of modern government, and that it was both the right and the duty of the State to be apprised of, and to investigate where necessary, all fields of national activity, the President of the Turkish Republic, in 1925, engaged the services of a Belgian expert, M. Camille Jacquart, charging him with the organization and establishment of an efficient and dependable statistical service—a task which, having regard to the strong suspicion of the motives of every Government which have been characteristic of the Turks throughout all ages, bristled with the most difficult problems. Next to nothing was known of the population, for no dependable census had been held in Anatolia since Byzantine days, yet the Government decided that a Census must be taken and

the enumeration carried out in a manner which would provide every possible guarantee for the accuracy of the results obtained. For this difficult undertaking M. Jacquart was compelled to raise and train some 50,000 special census agents—hold trial censuses in various areas—and, on the actual day appointed for the operation (October 28, 1927), provide every possible precaution against evasion. These are but some of the difficulties encountered and overcome in one branch of statistical enquiry which was carried through with remarkable success. The first annual report of the Turkish Statistical Bureau (*Annuaire Statistique de la République Turque*, 1928) now to hand, contains no mention of the difficulties and obstacles which hampered the activities of the newly created statistical service, but is modestly content with the presentation of data which have been collected from various sources during the past three years. Instead of former conjectural estimates of the numbers of citizens, the results of the census of 1927 provide a valuable contribution to our knowledge of the numbers of the Turkish people, classified by sex and locality. Considerable data relating to financial, commercial, social, etc. aspects of the country are contained in the volume, though it is to be regretted that it was not possible to include natality and mortality data in the issue under review. Future endeavours will serve to fill in such lacunae as are observable in the first volume of a series which ultimately will prove of inestimable value, not only to the statisticians, but to administrators, publicists, scientists, and others who have occasion or inclination to study the many aspects of national activity in modern Turkey.

Hungary has recently joined the array of countries which compile regular indices of the economic situation. We have received the first number of a bulletin of which the German title is *Mitteilungen der Ungarischen Landeskommision für Wirtschaftsstatistik und Konjunkturforschung*. A preliminary article by Dr. Ludwig Bene describes the nature of the information and the methods of compiling the indices, and the statistical reports and tables are followed by a bibliography of "Konjunkturforschung," the statutes of organization of the Landeskommision, and a list of its members, the whole of the text being printed in both Hungarian and German. The Landeskommision is, like the corresponding German Institute, in touch with the official statistical office through its President, who is Dr. Alois Korács, Director of that Office and a Vice-Secretary of State.

It is always encouraging to see the extension of statistical studies, and for that reason a welcome is to be given to the first number (for March, 1929) of *The Statistical Monthly*, published by the Bureau of Statistics, Legislative Yuan, the National Government of China, at

Nanking. As the articles are written in Chinese (though oddly enough tables of figures are given in Western numerals) the editors feel themselves excused from attempting any criticism. A table of contents in English is, however, also provided from which it appears that the principal articles deal with "co-ordination of the statistical work of the Government," "the examination of final digits by experiments in artificial sampling" (republished from *Biometrika*), "statistics in China," "some recent population statistics of China," "our foreign trade index-numbers for the last fifty years," "crop forecasting," and a "plan for a general survey of the living conditions in China."

Pending the carrying out of the official plan above referred to, attention may be directed to an interesting investigation carried out in Peking, the results of which have been summarized in a report of 158 + xxii pages under the title "Livelihood in Peking," published in 1928 at Peking for the Social Research Department of the China Foundation for the Promotion of Education and Culture, by Mr. L. K. Tao, B.Sc. (Lond.), formerly Professor of Sociology at the National University, Peking. An enquiry was held into the conditions of 48 working-class families and 12 families of elementary school teachers. The working-class families included 220 persons, of whom 72 males and 74 females out of 114 males and 106 females were gainfully employed; of the males, 41 were rickshamen and 6 were apprentices, while 59 of the women were sock finishers, artificial flower makers, yarn spinners, and seamstresses. The average income per family was a little over 103 dollars in six months, and the expenditure was about two dollars less. The expenditure is separately analysed under "food consumption" and "housing, household equipment, and clothing." A separate chapter is devoted to the rickshaman. The 12 teacher families included 61 persons, and the average family income was 56.39 dollars a month, and the average expenses 47.70 dollars.

The 48 working-class families were typical of those on the verge of poverty, while the 12 teacher families represented on the whole the comfortable classes. The collection of the working-class family budgets was undertaken by two investigators who visited their clients daily and made up their accounts, and over the period concerned about a couple of dollars was paid to each family for their trouble. Much suspicion was met with lest this strange enquiry might form the basis for some new taxes, and in this respect there seems to be much community of thought between the Chinese rickshaman and the Western industrialist. Mr. Tao's book is a pioneer work and will well repay reading for the insight which it gives into Chinese city life.

In a paper entitled *Some Problems of Statistics of Accidents as illustrated by the British Statistics* (reprinted from the *International Labour Review* of December, 1928), Mr. J. W. Nixon devotes some 30 pages to the discussion of British Statistics of Accidents, and comments upon the difficulties of securing international comparability, and the desirability of establishing the collection of such data after a uniform method. But, as the data result from independent legislative measures framed by various Government departments to meet strictly *national* requirements, it would be necessary to prove that any proposed uniform system continued to serve the particular interests of each country. Such a proof might be difficult, if not impossible, to bring. In any case, is it practical politics to carry the demand for international uniformity to such lengths as to require that the complex statistics of accidents shall be calculated and compiled after a standard common to all countries? Within the limits of the same State it is of course advisable—yet even then not always possible—to ensure that methods of collection and classification of data by different administrative departments should be similar. There is a real danger that a formal comparability may mask an essential, inherent lack of comparability.

In the Third edition of his *Wealth* (P. S. King, 1928, 5s. net), Professor Cannan has modified the contents and arrangement in response to suggestions and criticisms from his readers as well as in accordance with the changes which have taken place in the structure of the economic world since 1916, when the second edition appeared. The book has been re-set in bolder type; the chapters are now divided into sections; the greater part of the introductory chapter has been omitted as "too difficult for beginners," while the section on "Money" has been expanded into a chapter, which the author hopes, however, "will not prevent students from seeking further information in my *Money* and elsewhere." Other portions of the book have also been amplified, notably those relating to the principle of the avoidance of unnecessary labour and to the conception of an optimum population; and the old chapter on the Wealth of Nations has multiplied by division into two: "Trade between Countries," and "The Wealth of the Inhabitants of Different Countries," respectively. In short, one of the most inviting paths to the study of economics has been rendered even more smooth and attractive to the general reader, for whom it is intended.

Professor Bowley's *Elements of Statistics* (5th edition) has been translated into French by the late Louis Suret and by Georges Lutfalla, and published by Marcel Giard as a volume of the Bibliothèque Internationale d'Economie Politique edited by Alfred Bonnet,

a series which already includes among English authors the names of Petty, Marshall, Jevons, and Cannan. We congratulate our colleague on this extension of the already considerable circulation of his well-known work.

Since the issue of the last number of the *Journal*, the Society has suffered the loss by death of Sir Henry Rew, a past President, of Sir George Handley Knibbs, an Honorary Fellow, and of Professor Allyn Young. The obituary notice of Sir Henry Rew, who was so intimately associated for many years with all the activities of the Society, follows on page 297. Sir George Knibbs, living at the other side of the world, was unable to participate directly and continuously in the Society's work, but his election as a Fellow in 1906, the year in which he was appointed Commonwealth Statistician, formed a valuable link with the central statistical organisation of the Dominion of Australia. In 1920 he represented his Government at the Imperial Conference of Statisticians held in London, and during his stay read a paper before the Society on the *Organization of Imperial Statistics*; in the same year he was elected an Honorary Fellow in recognition of his services to statistical science. In 1921 he left the Statistical Bureau to become Director of the Australian Institute of Science and Industry, and in 1923 he received a knighthood. His official work by no means absorbed the whole of his energies; during the same period he was in turn Royal Commissioner for education, for insurance, and for trade and industry. During the war he was consulting member of the Munitions Committee, and in 1919 he was the Australian delegate to the Conference on Double Income Tax and War Profits in London. He also found leisure to write and publish poems. His personality was as genial as his energy was abundant, and his death, in his seventy-first year, is sincerely mourned by the Council.

By the death of Professor Allyn Abbott Young, at the early age of fifty-two, economic science has been deprived of a distinguished exponent, whose loss is deplored in England as profoundly as in his native country. Professor Young was elected a Fellow in 1911, some years before he was called to the Professorship of Economics at Harvard, a post he filled with much distinction until 1927, when he left the United States to occupy the Chair of Political Economy in the University of London, an experiment which was looked upon as an important event in the economic world and proved an unqualified success. It had been hoped that during Professor Young's residence in London he might be brought into closer touch with the work of the Society. The time was unfortunately too short for the fulfilment of this hope, but the Council wish to add their testimony to the esteem in which he was held by all who knew him or his works.

OBITUARY.

SIR R. HENRY REW, K.C.B.

By the death of Sir Henry Rew, which took place on 7th April last, in his seventy-first year, the Royal Statistical Society has lost one who served it in many capacities through a long term of years. Elected in 1888, he first joined the Council in 1897, and his service was from that time unbroken till his death. In 1902 he was elected one of the Honorary Secretaries, and held that office till 1915. He was Honorary Foreign Secretary from 1909 until his election as President in 1920. His presidential addresses dealt with the Organization of Statistics and with the Progress of British Agriculture, both subjects to which he had devoted attention in earlier communications. Elected a member of the International Statistical Institute in 1905, he was a regular attendant at the periodic meetings of that body and succeeded Major Craigie as its treasurer in 1913. In that capacity he represented English views on the Executive Committee (known as the Bureau) of the Institute.

Henry Rew began his career as a writer on agricultural subjects, and the ease and fluency both in writing and speaking, which so distinguished him in after life, soon brought him to public notice.

He was appointed Secretary of the Central Chamber of Agriculture in 1890, and a few years later, in 1894, was introduced to official life by being appointed an Assistant Commissioner to the Royal Commission on Agriculture. The excellent reports which he wrote in this capacity, and the active interest which he displayed in agricultural statistics, led in 1898 to his appointment to the Statistical Branch of the Board of Agriculture. When he went to the Board he found established an organized system of collecting statistics dating back to 1867, the foundation of which had been laid by Sir Robert Giffen, and continued and improved under the critical observation and control of Major Craigie, another Past President of the Society, who is fortunately still with us. Rew devoted himself soon after joining the staff of the Board to an examination of methods, and on the whole found little to criticize or alter. His work lay rather in the gradual introduction of new features and in the widening of the scope of the statistics. Up to that time, they had been confined mainly to the ascertainment annually of the acreage and number of livestock, and the estimation of the production of the principal crops. In 1904 he obtained authority to undertake the collection and publication weekly of the prices of the principal farm

products, and in 1906 this was followed by the introduction of an annual agricultural index-number, which has since proved of the greatest value as a guide to the movements in agricultural prices.

Another direction in which he opened new ground was in the formation of estimates of the production of meat and milk and of other similar products, which were not then covered by the official statistics. So far back as 1892 Rew had read a paper before the Royal Statistical Society on the "Production and Consumption of Milk and Milk Products," and he took a leading part in the appointment by the Society in 1901 of a committee to enquire into "the statistics available as a basis for estimating the production and consumption of meat and milk." It was indeed for his work as reporter of this committee that he was awarded the Guy Medal in 1905. This desire to widen and complete the official statistics relating to agriculture was for many years Rew's principal preoccupation, and he was able to see his work in this direction brought to fruition in the official enquiry made in 1908 into the agricultural output, which was conducted under his direction and on which he made a valuable report in 1912.

He was a frequent contributor to the *Journal* of the Royal Agricultural Society and other similar organs, and it was noticeable that he often used these contributions as a means for publishing estimates based on information which he himself had collected but which were not founded on a sufficiently wide basis to be issued officially. He was essentially a "practical" statistician, and his aim was, on the one hand, to provide the producer with early and up-to-date statistics of prices and supplies, and on the other to furnish information for the use of the Government, and for publicists and economists, as to the extent and progress of all branches and all aspects of the agricultural industry.

From the outbreak of the war he was adviser to the Government on questions of food supply, and was particularly associated with the supply of wheat to Great Britain and the Allies, being Chairman of the Grain Supplies Committee in 1914-16, and of the Allies' Wheat Purchasing Committee in 1915, and a member of the Royal Commission on Wheat Supplies in 1916. His extensive knowledge of all food supply matters led to his appointment as Secretary of the Ministry of Food on its establishment in 1916, and at this time he received the honour of a K.C.B. He did not remain long, however, at the Ministry of Food, as about the middle of the following year the Agricultural Wages Board was established, to which he was appointed Vice-Chairman. He threw himself into the very difficult and contentious work of the Wages Board with his accustomed vigour and energy, and was the principal guiding force in its administration until the Act under which the Board operated was repealed in 1921, when he

retired from the public service. In 1919 he was a member of the Inter-Departmental Committee on Meat Supplies.

After his retirement, Sir Henry Rew still continued to take an active interest in public affairs, and contested South Oxfordshire in the Liberal interest in 1922 and 1923, though unsuccessfully. He was a member of the Royal Commission on Food Prices in 1924-5, and also Chairman of the Inter-departmental Committee on the Application of Unemployment Insurance to Agriculture. During the last year or two he showed some disposition to take things a little more easily, though as recently as last summer, at the age of seventy, he did not hesitate to undertake a long journey from his home in Kent, starting about six in the morning, in order to preside at a meeting of the Agricultural Economics Society.

All who knew him appreciated and valued his judgment, which was singularly sound and clear-minded, and though he was an unsparing critic of doubtful views and dubious enterprises, he never failed to relieve his criticism with touches of humour and a distinguished courtesy which endeared him to all. Everyone interested in agricultural economics must deplore the passing of one who may fairly be regarded as a pioneer in the practical utilization of agricultural statistics.

The Council, at its meeting in April, directed that the following letter should be addressed to Lady Rew :—

11th April, 1929.

DEAR LADY REW,

I am instructed by the President and Council of the Royal Statistical Society to express to you their sorrow and their sympathy with you on the death of your husband. They recall his great services to the State, both in a private capacity and as a prominent official in the Ministry of Agriculture, but their grief is of a more intimate kind when they remember him as a trusted colleague. The Society showed their appreciation of his long service as Honorary Secretary and Foreign Secretary when they elected him to be their President for 1920-21 and 1921-2, and his loss leaves a gap in the ranks of the members that will not easily be filled. The present officials of the Society have always regretted that it had not been possible for Sir Henry to maintain in recent years his former close participation in the affairs of the Society, and they have a keen feeling of personal loss in the final cessation of their old close association with him. The whole Society mourn the death of a distinguished public servant and of a talented and valued colleague.

Again with the assurance of our deepest sympathy,

Yours sincerely,

(Signed) HENRY W. MACROSTY.

Hon. Secretary.

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AUGUSTUS SAUERBECK.

IN the last number of the *Journal* we recorded with regret the death of Mr. Augustus Sauerbeck, whose name has long been familiar to the whole statistical world as that of the author of the Sauerbeck Index-Number. His concern with prices derived from his interests as a man of business, as an authority on the wool trade, and as the compiler of the well-known annual wool circulars of Messrs. Helmuth Schwartze and Co. From these beginnings he passed in the footsteps of Tooke and Newmarch, Jevons, and others to the collection of more general data regarding prices and to their scientific study. Thus he came to compile his series of index-numbers to measure the fluctuations of wholesale prices for the period 1846-86, based on the average prices of 1867-77. His painstaking thoroughness and excellent judgment enabled him to produce results that soon obtained for his series a very high standing among similar index-numbers of prices.

His investigations were described and discussed in a paper read by him before the Royal Statistical Society in 1886, the year in which he became a Fellow, followed by a second paper in 1893. In the following year the Society expressed its sense of his services to statistics by awarding him the Guy Medal in silver. From 1886 to 1912 he contributed annual articles to the *Journal* of the Society, bringing his calculations up to date, but then on retiring from business he handed over the calculation and publication of his Index-Number to the *Statist* on the mutual understanding that the *Statist* would continue to furnish to the *Journal* yearly articles similar to those which he had contributed. The results of this undertaking will be familiar to Fellows, but probably it is less well known that a few years ago Mr. Sauerbeck entrusted his collection of unpublished price data to the custody of the Society. It may be noted that he ultimately continued his Index-Number back to 1818 and that he worked on the relation between the production of the precious metals and prices.

For a long period Augustus Sauerbeck was a "clarum et venerabile nomen," and it was with this feeling that the Society honoured itself and him by electing him an Honorary Fellow in 1920. His kindly nature led him willingly to assist enquirers into prices and their measurement, and many are those who were indebted to him for help. His solid achievements in statistical science are now and will long continue to be of value alike to commercial men and to statisticians.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Accountants' Magazine, March, 1929—Factory accounts, ancient and modern: *A. Cathles*.

Bankers' Magazine—

February, 1929—Credit and trade in 1928. The new agricultural bank. Bank rate chart and statistics.

March, 1929—Bankers and industry. The rise in the bank rate.

Biometrika—

December, 1928. Vol. XXa. Parts III and IV—On the use and interpretation of certain test criteria for purposes of statistical inference: *J. Neyman* and *E. S. Person*. Appendix to Dr. Gray's paper. On the correlation of two first order multiple correlation coefficients: *K. P.* and *E. S. P.* On corrections for the moment coefficients of frequency distributions when there are infinite ordinates at one or both of the terminals of the range: *G. E. Pearse*. The distribution of frequency constants in small samples from symmetrical populations: *E. S. Pearson* and *N. K. Adyanthaya*. On the means of samples from a U-shaped population: *K. J. Holzinger* and *A. E. R. Church*. Discussion of small samples drawn from an infinite skew population: "*Sophister*."

—Vol. XXb. Parts III and IV—On the application of the coefficient of racial likeness to test the character of samples: *Karl Pearson*. A preliminary classification of European races based on cranial measurements: *G. M. Morant*. Note on standardization in the method of using the coefficient of racial likeness: *Karl Pearson*.

East India Association, Journal, January, 1929—Indian education under the reforms: *J. A. Richey*.

Eugenics Review, January, 1929—The birth-rate changes: *Karl Edin*.

Institute of Bankers, Journal—

February, 1929—The financial machinery of the City of London. Lecture II: *D. Spring-Rice*. The future of British trade and industry: *Sir Basil Blackett*, K.C.B.

March, 1929—The financial machinery of the City of London. Lecture III: *D. Spring-Rice*. The Agricultural Credits Act, 1928: *S. J. M. Sampson*.

Royal Anthropological Institute, Journal, July–December, 1928—Racial anthropometry: a plan to obtain international uniformity of method: *M. L. Tildesley*. The incidence of phthisis in relation to race-type and social environment in South and West Wales: *E. G. Bowen*.

UNITED KINGDOM—Contd.

Royal Meteorological Society, Quarterly Journal, January, 1929—
The distribution of the average seasonal rainfall over Europe :
J. Glasspoole.

Statistical and Social Inquiry Society of Ireland, Journal, October, 1928—Report of the Irish Poor Law Commission : *Charles Eason.* National health insurance : *R. G. Riordan.* National health insurance from the workers' standpoint : *L. J. Duffy.* Statement of the views of employers in the Irish Free State on the system of national health insurance : *J. C. M. Wason.*

Surveyors' Institution, Journal—

February, 1929—Discussion on "The Charing Cross Bridge problem." The significance of the timber merchant in estate forestry : *H. J. Vaughan.*

March, 1929—Recent developments in town planning : *F. Longstreth Thompson.*

UNITED STATES—

American Academy of Political and Social Science, Annals—

January, 1929—Whole number on tariff problems of the United States: I. Re-examining American tariff problems. II. Making the tariff. III. Agriculture and the tariff. IV. Foreign investments and the tariff. V. International complications of the tariff. VI. Conclusion.

March, 1929—Whole number on farm relief: I. Some facts on farm relief. II. Some causes. III. Some economic remedies.

American Philosophical Society, Proceedings, Vol. LXVII. No. 3—Some economic implications of America's changing world status : *E. M. Patterson.*

Journal of Political Economy, February, 1929—Gold economics and stable prices : *L. D. Edie.* The population problem since the world war : *A. B. Wolfe.*

Monthly Labor Review—

January, 1929—Relative cost of material and labor in building construction. Beneficial activities of American trade-unions. Industrial accidents in the construction industry : *Ethelbert Stewart.*

February, 1929—Character of trade agreements in the United States.

Quarterly Journal of Economics, February, 1929—Carrier property consumed in operation and the regulation of profits : *G. O. May.* Self-limiting and self-inflamatory movements in exchange rates : *F. D. Graham.* The export debenture plan for aid to agriculture : *Joseph S. Davis.* The German building guilds : *William T. Hann.*

Review of Economic Statistics, February, 1929—Review of the year 1928 : *Editorial.* Wholesale commodity prices in the United States, 1843-62 : *Arthur H. Cole.* The copper industry in 1928 : *F. E. Richter.* Recent expansion of bank credit : *A. Ross Eckler.*

DENMARK—

Nationaløkonomisk Tidsskrift. Hefte 1, 1929—Stats og Kommuners Kapitalbehov : *J. Schaarup.*

EGYPT—

L'Égypte Contemporaine, January, 1929—Le protectionnisme d'après-guerre et les efforts pour le combattre. Le libre-échange moyen pacificateur : *A. C. Pilavachi.*

FRANCE—

Journal des Économistes—

January, 1929—Le budget de 1929 : *Édouard Payen.* La population du globe et des principaux pays : *R. J. Pierre.* Les chances de la stabilisation économique en Pologne : *K.*

February, 1929—L'agriculture et les villes tentaculaires : *R. J. Pierre.* Les chemins de fer français depuis cinquante ans : *G. de Nourion.* Le commerce extérieur de la Tchécoslovaquie : *S. Borodaeusky.*

Journal de la Société de Statistique de Paris—

January, 1929—La population française jusqu'en 1956. Essai de prévision démographique : *A. Sauvy.*

February, 1929—Nouveaux essais statistiques sur les mouvements boursiers : *J. Dessirier.*

La Réforme Sociale, January-February, 1929—L'organisation scientifique du travail en Tchécoslovaquie : *M. J. Rueckl.*

Revue d'Économie Politique, January-February, 1929—Une politique de la dette publique : *Giscard D'Estaing.* La C. G. C. (Confédération Générale des Consommateurs) : *Charles Gide.* Les équations de Walras et de Cassel et la théorie de la productivité marginale : *Wilhelm L. Falk.* Les cadres d'une histoire économique de la France dans ses relations avec l'histoire générale et la science économique : *Henri Sée.* Les États-Unis vont-ils devenir pays importateur de viande ? *Octave Festy.*

ITALY—

Giornale degli Economisti e Rivista di Statistica—

January, 1929—L' " homo economicus " e l'esperienza fascista : *Mario Alberti.* Sull' influenza dell'imposta sulla domanda e sull'offerta : *Renzo Fubini.*

February, 1929—Ripartizione del prodotto totale e offerta a costi congiunti : *Aldo Crosara.* Le equazioni differenziali della dinamica economica : *Luigli Amoroso.* Le idee di un ignoto mercantilista piemontese del secolo decimottavo : *Raffaele di Tucci.*

Giornale di Matematica Finanziaria, August-October, 1928—Per la tavola di mortalità degli assicurati italiani : *F. Insolera.* La tavola di mortalità degli assicurati italiani : *P. Smolenski.*

Rivista Italiana di Statistica, January, 1929—Il volume degli scambi. Statistiche e teorie monetarie : *F. Vinci.* La statistica nell'industria : *Elio Gabellini.*

SWEDEN—

Ekonomisk Tidskrift, Årg. XXX. Häft 10-12—Aktuella problem: *D. Davidson*. Den tyska arbetarrepresentationen: *C. A. J. Gadolin*. Werner Sombarts "Kapitalismus" i sin nya gestalt: *G. F. Steffen*.

INTERNATIONAL—

International Labour Review—

January, 1929—Seasonal unemployment in the building industry in certain European countries: I: *L. Hersch*.

February, 1919—Business forecasting in the United States, recent developments in individual companies: *J. H. Richardson*. Seasonal unemployment in the building industry in certain European countries: II: *L. Hersch*.

March, 1929—The organization of state industry in Soviet Russia: *N. S. Timacheff*. Seasonal unemployment in the building industry in certain European countries: III: *L. Hersch*.

LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part I, 1929, the Society has received the publications enumerated below :—

I.—OFFICIAL PUBLICATIONS.

(a) United Kingdom and its several Divisions.

United Kingdom—

Industry and Trade, Committee on. Final report of the Committee. 338 pp. London, 1929. 5s 6d (The Committee.)

Treasury. Import and export list. xii + 106 pp. London, 1928. 9d. (H.M. Stationery Office.)

Overseas Trade, Department of—

Reports on commercial, financial, and economic conditions as follows : Argentine Republic (1928), 3s.; Bolivia (October, 1928), 1s. 6d.; Dominican Republic and the Republic of Hayti (September, 1928), 1s.; El Salvador (January, 1929); French zone of Morocco, with notes on the commerce of Mogador, Agadir, and District, and in the Marrakesh district of South Morocco (March, 1929); Netherlands East Indies (October, 1928), 3s.; Republics of Nicaragua and Guatemala (October, 1928), 1s. 6d.; Philippine Islands (1925–28), 1s.; Siam (1928), 1s. 6d.; United States of America (1929), 1s. 6d. (The Department.)

England and Wales—

Industrial Fatigue Research Board. Reports. No 52. The comparative effects of variety and uniformity in work. 36 pp. 1s. 3d. 53. The use of performance tests of intelligence in vocational guidance. v + 76 pp. 2s. 6d. 54. An investigation into the sickness of printers with special reference to the incidence of tuberculosis. ix + 114 pp. 4s. 6d. London, 1929. (The Board.)

(b) India, Dominions, and Protectorates.

India—

Meteorological Department. Scientific notes. Vol. I. 1. A comparison of upper and gradient winds at Agra and Bangalore. Pp. 1–12. 2s.; 2. An analysis of the Madras hourly rainfall records for 1865–75 and 1901–17. Pp. 12–24. 1s.; 3. Thunderstorms of Calcutta, 1900–26. Pp. 25–36. 3d. Calcutta, 1928. (The Department.)

Irish Free State—*Industry and Commerce, Department of—*

Population, Census of, 1926. Vol. III. Part I. Religions. Part II. Birthplaces. viii + 221 pp. 2s. 3d. Together with a preliminary analysis containing only outstanding figures. 28 fol. pp. Dublin, 1929. (The Department.)

Production, Census of. 1926. Preliminary reports—Nos. 19. Clothing and millinery trades. 7 fol. pp.; 20. Aerated waters and bottling trades. 5 fol. pp.; 21. Wood furniture and upholstery trade. 6 fol. pp.; 22. Building and contracting trades. 7 fol. pp.; 23. Timber trade. 6 fol. pp. 24. Laundry, dyeing and cleaning trades. 6 fol. pp.; 25. Bricks and monumental masonry trades. 4 fol. pp. Dublin, 1928–9. (The Department.)

(b) India, Dominions and Protectorates—*Contd.*

Canada—

Animated atlas of the Dominion of Canada. 20 pp. Ottawa. (Natural Resources Intelligence Service.)

New Zealand—

Population Census, 1926. Vols. IV. Conjugal condition. 60 pp. 2s. 3d.
VI. Race aliens. 34 pp. 2s. VIII. Religious professions. 37 pp.
2s. Wellington, 1928-9. (Census and Statistics Office.)

(c) Foreign Countries

Czechoslovakia—

Population de la République. Études démographiques.—1. 1927. 111 pp
Prague, 1928. 35 Kc. (L'Office de Statistique.)
Superficies ensemencées et récoltées des produits agricoles en 1923 et
industrie agricole (brasseries en 1923, sucreries et distilleries pendant les
campagnes de 1922-3) avec un supplément relatif à l'agriculture en 1923
dans la République tchécoslovaque. xxiv + 290 pp. Prague, 1925.
(*Id.*)

Germany—

Statistik des Deutschen Reichs—

Band 357. Statistik der Vermögensteuerveranlagung 1925. 403 pp.
Berlin, 1929. 25 Rm. (Statistisches Reichsamt.)

Sonderhefte zu Wirtschaft und Statistik, Nr. 5. Der Geburtenrückgang
im Deutschen Reich. Die allgemeine deutsche Sterbetafel für 1924-5.
46 pp. Berlin, 1929. 3 Rm. (*Id.*)

Volks- Berufs- und Betriebszählung, 1925. Band 403. Heft 9; Band
417. Hefte 11a, 11b. Berlin, 1928. (*Id.*)

Italy—

Le malattie mentali in Italia. Relazione statistico-sanitaria sugli alienati
presenti nei luoghi di cura al 1 Gennaio 1926. 120 pp. Roma, 1928.
(Istituto Centrale di Statistica.)

Periodici gestiti dalla Libreria dello Stato e dati in abbonamento. Anno
1929. VII. 2 pp. Roma, 1928. (Ministero delle Finanze.)

Poland—

Statistique de l'abatage du bétail. Relevé trimestriel, 1929. Tome I.
Fasc. 1. 22 pp. Warsaw, 1929. (L'Office Central de Statistique.)

Le premier recensement général, 1921.

Tome XI. Fasc. 4. Exploitations rurales. Départements de l'Ouest.
xxiv + 97 pp. Warsaw, 1928. (*Id.*)

Tome XXVI. Fasc. 2. Lieu de naissance. Durée du séjour. Tableaux.
257 pp. Warsaw, 1928. (*Id.*)

Russia—

Industrie des fabriques et usines de la ville et du gouvernement de Moscou
en 1917-27. 173 pp. Moscow, 1928. (Central Statistical Board.)

Recensement de la population de l'U.R.S.S. Groupes ethniques, langues, âge,
instruction. Vols. III, VI, VIII, and XVI. Moscow, 1928. (*Id.*)

Ukraine—

Académie des Sciences de l'Ukraine. Travaux de l'Institut Démographique—
Tome V. Mortalité en Russie et en Ukraine. 195 pp. Kiev, 1928.
(The Author.)

Tome VI. Mortalité en les 11 nationalités de la Russie à fin du XIX
siècle. Par M. Ptoukha. 57 pp. Kiev, 1928. (The Author.)

Statistical Review of Ukraine. 142 + iii + 26 pp. Kharkov, 1928.

(c) Foreign Countries—*Contd.*

United States—

Agriculture, Department of—

Reprints from Yearbook, 1927. Nos. 974-976, 978, 979, 1023. Washington, 1928. (The Department.)

Miscellaneous Publication, No. 28. The live-stock review for 1927. 44 pp. Washington, 1928. 10 cents. (*Id.*)

Statistical Bulletin, No. 23. Car-lot shipments and unloads of important fruits and vegetables for 1924-6. 145 pp. Washington, 1928. 25 cents. (*Id.*)

Technical Bulletin No. 79. Major transactions in the 1926 December wheat future. 52 pp. Washington, 1928. 10 cents. (*Id.*)

Banking and Currency, Committee on. Stabilization. House of Representatives. 70th Congress. 458 pp. Washington, 1928. (The Committee.)

California State Fisheries Laboratory—

Fish Bulletin. Nos. 12. The weight-length relationship of the California sardine at San Pedro. 59 pp. California, 1928. (The Laboratory.)

13. Seasonal average length trends at Monterey of the California sardine. 13 pp. California, 1928. (*Id.*)

*Labor, Department of—**Children's Bureau—*

Chart No. 15. State laws and local ordinances regulating the street work of children. A tabular summary of regulations in effect in the United States. 27 pp. Washington, 1929. (The Bureau.)

Publication Nos. 187. Children in agriculture. 81 pp. Washington, 1929. 25 cents. 190. Children of illegitimate birth whose mothers have kept their custody. 105 pp. Washington, 1928. 20 cents. (*Id.*)

Labor Statistics, Bureau of—

Bulletin Nos. 464. Retail prices and cost of living series. Retail prices 1890-1927. 221 pp. Washington, 1928. 35 cents. (The Bureau.)

467. Miscellaneous series. Minimum wage legislation in various countries. 125 pp. Washington, 1928. 20 cents. (*Id.*) 483. Miscellaneous series. Conditions in the shoe industry in Haverhill, Mass., 1928. 107 pp. Washington, 1929. 20 cents. (*Id.*)

Women's Bureau. Bulletin No. 68. The effects of labor legislation on the employment opportunities of women. 22 pp. Washington, 1928. 10 cents. (The Bureau.)

Massachusetts Child Labor Committee. The school and the working child. x + 226 pp. Boston, 1928. (The Committee.)

Uruguay—

Direccion General de Estadistica. Publicacion LXXX. Boletin de estadistica de la Republica Oriental del Uruguay. 24 pp. Montevideo, 1928. (Direccion General.)

(d) International.

League of Nations—

Economic and Financial Section—

Counterfeiting currency. Summary. 30 fol. pp. Geneva, 1928. (The League.)

Double taxation and fiscal evasion, Collection of international agreements and international legal provisions for the prevention of. 278 pp. Geneva, 1928. (*Id.*)

Draft convention for financial assistance. 20 fol. pp. Geneva, 1929. (*Id.*)

Economic Committee. Sub-committee of experts for the unification of customs tariff nomenclature. Draft framework for a customs tariff nomenclature and draft allocation of goods to the various chapters of the framework, with explanatory notes. 96 pp. Geneva, 1928. (*Id.*)

Economic Statistics, Diplomatic conference on. 10 fol. pp. (Mr. Vernon Bartlett.)

— International conference relating to. 79 fol. pp. Geneva, 1928. (The League.)

(d) *International—Contd.***League of Nations—Contd.**

- Financial Committee. Report to the Council on the work of the 33rd session. 7 fol. pp. Geneva, 1928. (*Id.*)
- Report to the Council on the work of the 34th session. 3 fol. pp. Geneva, 1929. (*Id.*)
- International convention relating to the simplification of customs formalities. Measures taken by the Governments to give effect to the provisions of the convention. 5 fol. pp. Geneva, 1929. (*Id.*)
- International agreement relating to the exportation of hides and skins (and protocol). 15 fol. pp. Geneva, 1929. (*Id.*)
- International agreement relating to the exportation of bones. 13 fol. pp. Geneva, 1929. (*Id.*)
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- International conference for the abolition of import and export prohibitions and restrictions. 23 fol. pp. Geneva, 1929. (*Id.*)
- Supplementary agreement to the convention for the abolition of import and export prohibitions and restrictions. 16 pp. Geneva, 1929. (*Id.*)
- Refugee Settlement Commission. Twenty-first quarterly report 10 fol. pp. Geneva, 1929. (*Id.*)
- Bulgarian refugees. 10th report. 20 fol. pp. Geneva, 1929. (*Id.*)

International Labour Office—

- Studies and reports. Series D. (Wages and hours of labour). No. 15. The workers' standard of life in countries with depreciated currency. xi + 182 pp. Geneva, 1925. 3s. 6d. (Purchased.)
- International Co-operative Alliance Statistics of the affiliated national organizations for 1927. Explanations and notes in English, French, and German. 93 pp. London: The Alliance, 1929. 2s. 6d. (The Publishers.)
- International Relations Committee. Tsinan affair. Vol. I. 52 pp. Shanghai: The Committee, 1928. (The Committee)
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- Agricultural Economics Society. Proceedings of a conference held at Wadham College, Oxford, July, 1928. 55 pp. The Society, 1928. 2s. 6d. (The Society.)
- American Academy of Political and Social Science. Radio. Ed. by *J. Stewart*. 107 pp. Philadelphia, 1929. (The Academy.)
- American Statistical Association. Interim report of the proceedings of the first general assembly of the international union for the scientific investigation of population problems. (Reprint.) 1928. (The Association.)
- Banister (H.)*. Elementary applications of statistical method. 56 pp. London: Blackie & Son, 1929. 3s. 6d. (The Publishers.)
- Bouley (A. L.)*. Éléments de statistique. Traduits sur la cinquième édition anglaise par *L. Suret* et *G. Lutfalla*. 614 pp. Paris: Marcel Giard, 1929. 100 fr. (The Publishers.)
- British Association for the Advancement of Science. Report of the 96th meeting. lxxvii + 704 pp. London: The Association, 1929. (The Association.)
- Cabiati (Attilio)*. Scambi internazionali e politica bancaria. xiv + 297 pp. Torino: Fratelli Bocca, 1929. (The Publishers.)
- Carnegie Endowment for International Peace. Le centre européen de la division des relations internationales et de l'éducation. 116 pp. Paris: Centre européen de la dotation Carnegie, 1928. (The Publishers.)
- Economic and social history of the world war. Russia in the economic war. By *Baron B. E. Nolde*. xvi + 232 pp. New Haven: Yale University Press. London: H. Milford, 1929. 11s. 6d. (H. Milford.)

II.—Authors and Miscellaneous—*Contd.*

- Carnegie Endowment for International Peace. Studies in the war history of a neutral. Vol. IV. The Netherlands and the world war. The effect of the war upon banking and currency. By *Dr. G. Vissering* and *Dr. J. W. Holstijn*. War finances in the Netherlands, 1918-22: the costs of the war. By *Dr. H. C. Bordewyk*. xx + 226 pp. New Haven: Yale University Press. London: H. Milford, 1929. 14s. (*Id.*)
- Carnegie Institute of Washington. Eugenics Record Office. Bulletin No. 26. Birth and death rates of the feeble-minded. 34 pp. Cold Spring Harbour, Long Island, N.Y., 1928. (Eugenics Record Office.)
- Clay (Henry)*, M.A. Economics. An introduction for the general reader. xvi + 476 pp. Macmillan, 1928. (Reprint of 1916 edition.) 4s. 6d. (Purchased.)
- Dobbs (S. P.)*, B.A. The clothing workers of Great Britain. Introduction by the Rt. Hon. Sidney Webb. (No. 96 of Studies in Economics and Political Science.) xiv + 216 pp. London: Routledge, 1928. 10s. 6d. (Purchased.)
- Donaldson (John)*. International economic relations. xxx + 674 pp. London, New York, Toronto: Longmans, Green & Co., 1928. 16s. (The Publishers.)
- Fielding (Sir Charles)*, K.B.E. Prosperity for England. 19 pp. 1928. (The Author.)
- Fisher (Irving)*. Weekly wholesale index. 6 pp. (Reprint.) 1928. (The Author.)
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- Herzog (Peter)*. The Morris plan of industrial banking. 126 pp. Chicago: A. W. Shaw Co., 1928. \$2.00. (The Publishers.)
- Hooper (A. C.)*. Auditors and the Companies Act, 1928. Paper read to the S. Wales and Monmouthshire Society of Chartered Accountants. 29 pp. London: Gee & Co., 1928. 1s. 6d. (The Publishers.)
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PERIODICAL RETURNS.

REGISTRATION OF THE UNITED KINGDOM.

No. I.—ENGLAND AND WALES.

BIRTHS, DEATHS AND MARRIAGES—To 31st DECEMBER, 1928.

A.—*Serial Table of BIRTHS, DEATHS and MARRIAGES, returned in the Years 1922–1928, and in the QUARTERS of those Years.**Calendar YEARS, 1922–1928 :—Numbers.*

Years	1922.	1923.	1924.	1925.	1926.	1927.	1928.*
Births.....No.	780,124	758,131	729,933	710,582	694,563	654,172	660,267
Deaths	486,780	444,785	473,235	472,841	453,804	484,609	460,440
Marriages ..	299,524	292,408	296,416	295,689	279,860	308,370	302,810

QUARTERS of each Calendar Year, 1922–1928.

(I.) BIRTHS :—Numbers.

<i>Qrs. ended last day of</i>	1922.	1923.	1924.	1925.	1926.	1927.	1928.*
March.....No.	207,539	192,892	185,389	175,523	173,997	166,974	167,926
June „	200,524	196,754	187,038	186,864	181,332	170,778	170,997
September ..	195,718	190,062	186,579	181,835	174,837	163,854	165,675
December ..	176,343	178,423	170,927	166,360	164,397	152,566	155,669

(II.) DEATHS :—Numbers.

<i>Qrs. ended last day of</i>	1922.	1923.	1924.	1925.	1926.	1927.	1928.*
March.....No.	165,493	124,711	160,274	138,299	130,611	168,760	136,315
June „	120,302	114,044	114,188	113,218	113,809	107,595	114,748
September ..	90,927	91,250	90,138	95,054	90,705	92,238	93,738
December ..	110,058	114,780	108,635	126,270	118,679	116,016	115,639

(III.) MARRIAGES :—Numbers.

<i>Qrs. ended last day of</i>	1922.	1923.	1924.	1925.	1926.	1927.	1928.*
March.....No.	50,382	53,316	47,068	46,263	46,228	47,940	45,207
June „	82,817	74,929	81,301	81,921	78,393	84,963	84,745
September ..	89,730	87,289	89,841	90,314	83,830	91,888	94,403
December ..	76,595	76,874	78,206	77,191	71,409	83,579	78,455

* Provisional.

Annual Rates of BIRTHS, DEATHS and PERSONS MARRIED, per 1,000 PERSONS LIVING in the Years 1921-1928, and in the QUARTERS of those Years.

Calendar YEARS, 1921-1928:—General Ratios.

YEARS.....	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
Estd. Popln. of England and Wales in thousands in middle of each Year	37,887.	38,158.	38,403.	38,746.	38,890.	39,067.	39,290.	39,482.*
Births	22.4	20.4	19.7	18.8	18.3	17.8	16.6	16.7
Deaths	12.1	12.8	11.6	12.2	12.2	11.6	12.3	11.7
Persons Married	16.9	15.7	15.2	15.3	15.2	14.3	15.7	15.3

QUARTERS of each Calendar Year, 1921-1928.

(I.) BIRTHS:—Ratio per 1,000.

Qrs. ended last day of	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
March	22.4	22.1	20.4	19.2	18.3	18.1	17.2	17.1
June	23.9	21.1	20.5	19.4	19.3	18.6	17.4	17.4
September ...	22.5	20.3	19.6	19.1	18.6	17.8	16.5	16.7
December ...	20.9	18.3	18.4	17.5	17.0	16.7	15.4	15.7

(II.) DEATHS:—Ratio per 1,000.

Qrs. ended last day of	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
March	13.8	17.6	13.2	16.6	14.4	13.6	17.4	13.9
June	11.5	12.6	11.9	11.8	11.7	11.7	11.0	11.7
September ...	10.4	9.5	9.4	9.2	9.7	9.2	9.3	9.4
December ...	12.8	11.4	11.9	11.1	12.9	12.1	11.7	11.7

(III.) PERSONS MARRIED:—Ratio per 1,000.

Qrs. ended last day of	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
March	16.3	10.7	11.3	9.7	9.6	9.6	9.9	9.2
June	15.1	17.4	15.7	16.8	16.9	16.1	17.3	17.3
September ...	18.7	18.7	18.0	18.4	18.4	17.0	18.6	19.0
December ...	17.6	15.9	15.9	16.0	15.7	14.5	16.9	15.8

* Provisional figures.

B.—*Special Town Table*.—POPULATION; BIRTH-RATE and DEATH-RATE (Civilians) in each Quarter of 1928, in certain of the 107 County Boroughs and Great Towns.

Cities and boroughs.	Estimated population mid 1927.	Annual Rate to 1,000 Living during the thirteen weeks ending							
		March 31, 1928. (1st quarter.)		June 30, 1928. (2nd quarter.)		Sept. 30, 1928. (3rd quarter.)		Dec. 31, 1928. (4th quarter.)	
		Births.	Deaths.	Births.	Deaths.	Births.	Deaths.	Births.	Deaths.
107 county boroughs and towns	19,580,340	17·3	14·2	17·6	11·5	17·0	9·3	16·1	11·6
<i>Including—</i>									
London	4,541,000*	16·7	14·4	16·4	11·5	15·7	9·1	15·1	11·5
West Ham C.B.	315,400	19·7	12·9	18·9	10·0	18·6	8·8	18·2	10·2
Croydon C.B. ...	211,700	15·9	13·5	16·4	10·3	16·8	8·5	14·6	10·8
Brighton C.B. ...	140,700*	15·1	14·9	14·6	13·9	14·1	10·0	12·1	11·2
Portsmouth C.B.	232,100*	17·9	14·2	18·8	11·3	17·8	9·3	17·4	11·4
Bristol C.B.	385,700*	16·6	15·3	17·3	11·0	16·8	8·7	15·6	11·0
Cardiff C.B.	225,600*	19·1	13·5	17·8	11·1	18·5	9·7	17·5	12·2
Swansea C.B.	162,700	18·6	14·2	19·6	11·0	18·9	8·6	16·5	11·3
Wolverhampton C.B.	135,200	20·6	12·4	20·3	9·7	19·5	9·0	18·1	10·1
Birmingham C.B.	951,100	17·9	13·0	19·5	10·9	18·5	9·0	16·8	11·0
Norwich C.B.	124,600*	16·3	12·5	16·5	10·9	16·6	9·3	15·7	10·1
Leicester C.B.	245,000	17·0	12·4	16·9	11·1	16·2	9·0	15·2	11·3
Nottingham C.B.	265,700	17·7	15·1	18·1	12·2	17·8	10·0	17·5	13·0
Derby C.B.	136,400	16·4	13·9	18·7	10·5	18·4	8·3	17·0	10·6
Birkenhead C.B.	158,500	19·2	14·2	17·9	11·1	18·4	9·2	17·3	11·0
Liverpool C.B. ...	870,800	22·7	16·4	22·1	11·8	22·0	10·5	21·1	12·5
Bolton C.B.	178,300	15·7	16·9	15·5	11·7	14·5	9·8	13·1	12·6
Manchester C.B.	751,900	17·7	16·0	17·6	12·8	17·5	9·8	16·1	13·1
Salford C.B.	247,600	17·1	13·7	17·9	12·2	16·5	9·8	15·9	13·6
Oldham C.B.	141,400	15·2	16·2	14·9	14·8	14·5	11·6	13·4	13·7
Burnley C.B.	99,270	15·5	15·3	15·9	13·2	15·8	11·8	13·3	12·4
Blackburn C.B. ...	124,500	14·0	14·9	13·9	12·5	14·1	9·4	13·6	11·5
Preston C.B.	127,100	15·3	16·5	15·6	12·4	15·6	9·4	14·0	11·4
Huddersfield C.B.	112,100	13·6	15·4	15·0	12·8	14·2	11·6	12·6	12·2
Halifax C.B.	96,270*	14·0	16·2	13·2	12·4	11·8	9·9	13·7	13·7
Bradford C.B. ...	293,200	15·1	15·0	15·0	13·1	15·8	10·3	14·6	13·1
Leeds C.B.	477,600	15·9	14·3	17·3	12·5	16·0	9·8	14·8	13·1
Sheffield C.B. ...	524,900*	16·2	14·3	17·0	11·6	16·0	9·4	15·2	10·3
Hull C.B.	296,600	20·8	14·9	21·3	12·7	20·9	10·4	19·6	12·6
Sunderland C.B.	162,700	23·4	16·7	24·4	12·3	22·4	10·9	22·6	13·0
Gateshead C.B. ...	127,400	22·6	13·4	21·8	12·0	21·6	11·3	20·8	13·4
Newcastle-on-Tyne C.B. }	288,500*	18·4	14·5	20·0	12·5	18·7	10·6	18·2	12·2

* Excluding non-civilians.

Note.—The 107 great towns are those with populations exceeding 50,000 persons at the Census of 1921; before the second quarter of 1927 the figures referred to 105 towns only.

No. II.—SCOTLAND.

BIRTHS, DEATHS AND MARRIAGES, IN THE YEAR ENDED
DECEMBER 31, 1928.

I.—Serial Table:—Number of BIRTHS, DEATHS and MARRIAGES in Scotland, and their Proportion to the Population estimated to the Middle of each Year, during each Quarter of the Years 1924–1928 inclusive.

	1924.		1925.		1926.		1927.		1928.	
	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.	Number.	Per 1,000.
<i>1st Quarter—</i>										
Births	27,452	22·7	25,230	20·9	26,170	21·6	24,775	20·5	24,240	19·9
Deaths ...	21,967	18·1	18,350	15·2	17,928	14·8	19,437	16·1	19,385	15·9
Marriages	7,296	6·0	7,644	6·3	7,818	6·5	7,357	6·1	7,385	6·1
<i>2nd Quarter—</i>										
Births	27,985	23·1	27,909	22·9	26,996	22·1	25,116	20·6	25,720	21·1
Deaths ...	17,872	14·8	15,911	13·0	17,008	13·9	15,812	13·0	16,567	13·6
Marriages	7,971	6·5	8,014	6·6	7,682	6·3	7,941	6·5	7,907	6·5
<i>3rd Quarter—</i>										
Births	26,175	21·4	25,595	20·8	24,821	20·1	23,496	19·1	23,443	19·1
Deaths ...	13,703	11·2	13,450	10·9	12,866	10·4	13,641	11·1	13,457	10·9
Marriages	9,141	7·4	9,137	7·4	8,408	6·8	9,104	7·4	9,237	7·5
<i>4th Quarter—</i>										
Births	25,288	20·7	25,403	20·6	24,462	19·8	23,285	18·9	23,403	19·0
Deaths ...	16,815	13·7	17,796	14·4	15,978	12·9	16,940	13·7	15,851	12·9
Marriages	7,920	6·4	7,661	6·2	7,335	5·9	8,191	6·6	8,426	6·9
<i>Year—</i>										
Population	4,881,637		4,891,300		4,903,300		4,894,700		4,888,700	
Births	106,900	21·9	104,137	21·3	102,449	20·9	96,672	19·8	96,815	19·8
Deaths	70,357	14·4	65,507	13·4	63,780	13·0	65,830	13·5	65,260	13·3
Marriages ...	32,328	6·6	32,456	6·6	31,243	6·4	32,593	6·7	32,955	6·7

316 Registrar-General's Quarterly Returns:—Scotland. [Part II,

II.—*Special Average Table* :—Number of Births, Deaths and Marriages in Scotland and in the divisions of the counties during each Quarter of 1928, and their proportion to the population.

Registration group of districts.	Total Births.		Deaths.		Marriages.	
	Number.	Per 1,000 of population	Number.	Per 1,000 of population.	Number.	Per 1,000 of population.
1st quarter—SCOTLAND	24,246	19·9	19,385	15·9	7,382	6·1
Northern division ...	324	15·3	392	18·5	117	5·5
North Western div.	584	16·5	580	16·4	170	4·8
North Eastern div.	2,260	21·1	1,724	16·1	644	6·0
East Midland div. ...	3,249	17·9	2,864	15·8	875	4·8
West Midland div. ...	1,929	18·9	1,452	14·3	525	5·2
South Western div....	11,850	21·9	8,827	16·3	3,738	6·9
South Eastern div. ...	3,192	18·2	2,777	15·8	1,100	6·3
Southern div.	858	19·2	769	17·2	213	4·8
2nd quarter—SCOTLAND	25,716	21·2	16,567	13·6	7,907	6·5
Northern division ...	323	15·2	374	17·6	94	4·4
North Western div.	609	17·2	536	15·1	142	4·0
North Eastern div.	2,427	22·7	1,550	14·5	779	7·3
East Midland div. ...	3,495	19·2	2,422	13·3	1,002	5·5
West Midland div. ...	2,062	20·2	1,223	12·0	541	5·3
South Western div....	12,507	23·1	7,343	13·5	3,778	7·0
South Eastern div. ...	3,389	19·3	2,390	13·6	1,252	7·1
Southern div.	904	20·2	729	16·3	319	7·1
3rd quarter—SCOTLAND	23,441	19·1	13,457	11·0	9,233	7·5
Northern division ...	350	16·3	310	14·5	98	4·6
North Western div.	665	18·6	487	13·6	171	4·8
North Eastern div. ...	2,211	20·4	1,248	11·5	791	7·3
East Midland div. ...	3,048	16·6	2,019	11·0	1,226	6·7
West Midland div. ...	1,827	17·7	1,056	10·3	625	6·1
South Western div....	11,410	20·8	5,938	10·8	4,451	8·1
South Eastern div. ...	3,097	17·5	1,875	10·6	1,585	8·9
Southern div.	833	18·4	524	11·6	286	6·3
4th quarter—SCOTLAND	23,403	19·0	15,851	12·9	8,426	6·9
Northern division ...	358	16·7	321	15·0	118	5·5
North Western div.	576	16·1	536	15·0	184	5·1
North Eastern div.	2,279	21·0	1,446	13·4	838	7·7
East Midland div. ...	3,188	17·3	2,289	12·5	1,188	6·5
West Midland div. ...	1,781	17·5	1,200	11·7	601	5·8
South Western div....	11,247	20·5	7,098	13·0	3,893	7·1
South Eastern div. ...	3,149	17·8	2,224	12·6	1,306	7·4
Southern div.	825	18·3	737	16·3	298	6·6

Population of Scotland.

Population.	Scotland.	Northern division.	North Western division.	North Eastern division.	East Midland division.	West Midland division.	South Western division.	South Eastern division.	Southern division.
By Census of 1911	4,760,904	105,997	161,636	167,333	712,146	356,312	2,033,521	700,577	190,389
" " 1921	4,882,497	95,716	153,273	150,411	730,985	423,153	2,137,619	701,011	189,297
Estimated to mid 1928 ...	4,888,700	85,300	142,500	140,800	731,300	409,600	2,180,200	704,800	179,700

No. III.—NORTHERN IRELAND.

NORTHERN IRELAND.—*Number of Births, Deaths and Marriages for each Quarter of 1928 and their Proportion to the Population.*

	Births.		Deaths.		Marriages.	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter ...	6,560	21.0	5,349	17.1	1,390	4.5
2nd „ ...	6,975	22.4	4,420	14.2	1,837	5.9
3rd „ ...	6,445	20.7	3,739	12.0	2,085	6.7
4th „ ...	5,969	19.1	4,487	14.4	1,962	6.3
Total for year 1928	25,949	20.8	17,995	14.4	7,274	5.8

Population of Northern Ireland, estimated provisionally to mid 1928 (inclusive of military) :—1,248,000.

	Births.		Deaths.		Marriages	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
1st quarter—						
Total rural districts	2,900	18.8	2,824	18.3		
Total co. boroughs and urban dists.	3,660	22.9	2,525	15.8		
Belfast C.B. ...	2,446	23.6	1,598*	15.4		
Londonderry C.B.	281	25.0	219	19.4		
2nd quarter—						
Total rural districts	3,104	20.1	2,328	15.1		
Total co. boroughs and urban dists.	3,871	24.2	2,092	13.1		
Belfast C.B. ...	2,505	24.2	1,389*	13.4		
Londonderry C.B.	317	28.2	141	12.5		
3rd quarter—						
Total rural districts	2,908	18.8	1,940	12.6		
Total co. boroughs and urban dists.	3,537	22.1	1,799	11.3		
Belfast C.B. ...	2,261	21.8	1,222*	11.8		
Londonderry C.B.	288	25.6	109	9.7		
4th quarter—						
Total rural districts	2,730	17.7	2,211	14.3		
Total co. boroughs and urban dists.	3,239	20.3	2,276	14.2		
Belfast C.B. ...	2,144	20.7	1,595*	15.4		
Londonderry C.B.	272	24.2	141	12.5		

* Including deaths of persons admitted from Belfast into institutions outside the co. borough, numbering 58, 79, 58 and 67 in the respective quarters.

No. IV.—IRISH FREE STATE.

*Number of Births, Deaths and Marriages in the Irish Free State for each quarter of the year 1928, and their proportion to the population.**

	Births.		Deaths.		Marriages.	
	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.	Number.	Annual rate per 1,000 of population.
1st quarter ...	14,618	19.8	12,568	17.1	3,737	5.1
2nd „ ...	15,873	21.5	11,070	15.0	3,258	4.4
3rd „ ...	14,878	20.2	8,574	11.6	—	—
4th „ ...	—	—	—	—	—	—
Total for year 1928	—	—	—	—	—	—

Population of the Free State estimated to mid 1928 :—2,948,000.

	Births.		Deaths.		Marriages.	
	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.	Number.	Annual rate per 1,000 persons.
1st quarter, 1928—						
Total rural districts	9,593	18.4	8,601	16.5		
Total urban „	5,025	23.2	3,967	18.3		
Dublin registration area ...	2,664	25.2	1,991	18.9		
Cork regn. area	425	21.7	352	17.9		
2nd quarter—						
Total rural districts	10,496	20.2	7,827	15.0		
Total urban „	5,377	24.9	3,243	15.0		
Dublin registration area ...	2,828	26.8	1,572	14.9		
Cork regn. area	441	22.5	303	15.4		
3rd quarter—						
Total rural districts	9,672	18.6	6,025	11.6		
Total urban „	5,206	24.1	2,549	11.8		
Dublin registration area ...	2,711	25.7	1,210	11.5		
Cork regn. area	485	24.7	238	12.1		
4th quarter—						
Total rural districts	—	—	—	—		
Total urban „	—	—	—	—		
Dublin registration area ...	—	—	—	—		
Cork regn. area	—	—	—	—		

* Complete returns not yet available.

No. V.—GREAT BRITAIN AND IRELAND.

SUMMARY of BIRTHS, DEATHS and MARRIAGES, in the Year 1928.

(Compiled from the Quarterly Returns of the respective Registrars-General.)

Countries	[000's omitted]		Births	Per 1,000 of popula- tion	Deaths	Per 1,000 of popula- tion.	Mar- riages.	Per 1,000 of popula- tion.
	Area in statute acres	Popula- tion middle 1927, estimated						
England and Wales ... }	37,338	No 39,482	No. 660,267	Ratio. 16.7	No. 460,440	Ratio. 11.7	No 302,810	Ratio. 7.6
Scotland .	19,070	4,889	96,815	19.8	65,260	13.3	32,955	6.7
Northern Ire- land .	3,352	1,248	25,949	20.8	17,995	14.4	7,274	5.8
Great Britain and North- ern Ireland }	59,760	45,619	783,031	19.1	543,695	13.1	343,039	6.7
*Irish Free State ... }	17,019	2,948	—	—	—	—	—	—

Complete returns not yet available.

Imports.—Declared value of merchandise imported into the United Kingdom in the years ended December 31, 1926, 1927, 1928.

Countries from which consigned.	1926.	1927.	1928.
	£'000.	£'000.	£'000.
Russia	24,130	21,052	21,548
Finland	13,288	15,895	13,237
Sweden	21,426	25,259	22,045
Norway	12,163	12,923	12,008
Denmark, including Faroe Islands	47,954	49,973	53,056
Poland, including Dantzic	8,526	8,101	5,791
Germany	72,610	59,916	63,731
Netherlands	50,299	44,506	42,915
Java	9,951	10,031	8,131
Belgium	44,853	46,524	43,385
France	59,177	63,436	60,643
Switzerland	13,693	14,411	14,369
Portugal	4,499	4,803	3,692
Spain	17,047	18,789	18,287
Italy	15,734	16,776	15,764
Czechoslovakia	10,916	9,294	8,189
Greece	2,481	3,016	3,098
Roumania	2,673	2,408	1,761
Turkey, European and Asiatic, including Smyrna and Armenia	3,004	2,991	2,666
Egypt	25,101	23,681	26,297
China	11,539	12,123	11,978
Japan	7,204	8,164	8,737
United States	228,891	200,186	183,660
Cuba	4,499	6,608	10,170
Mexico	6,044	5,524	2,379
Peru	7,214	8,224	6,707
Chili	7,769	7,462	9,185
Brazil	4,251	4,480	4,691
Uruguay	4,545	4,581	7,029
Argentine Republic	67,605	76,496	76,785
Other countries	56,219	64,247	65,791
<i>Total—Foreign Countries</i>	865,205	851,680	832,725
BRITISH POSSESSIONS.*			
Irish Free State	40,866	43,247	45,144
British West Africa	12,549	11,467	11,440
Union of South Africa	18,908	21,415	24,245
British East Africa	5,865	5,826	6,140
British India, with Burma	57,638	65,840	64,401
Straits Settlements and Federated Malay States	26,230	21,605	12,598
Ceylon and Dependencies	17,931	16,643	13,830
Australia	61,030	52,740	54,469
New Zealand	46,813	46,549	47,815
Canada	64,048	55,152	57,110
British W. Indies, with Bahamas	4,822	4,487	5,346
Other Possessions	19,456	21,690	22,087
<i>Total—British Possessions</i>	376,156	366,661	364,215
<i>Total—Foreign Countries and British Possessions</i>	1,241,361	1,218,341	1,196,940

* Including Protectorates and Mandated Territories.

Exports: Declared value of U.K. Produce and Manufactures, and of Imported Merchandise, exported from the United Kingdom in the years ended December 31, 1926, 1927 and 1928.

Countries to which consigned.	1926.		1927.		1928.	
	Exports.	Re-exports.	Exports.	Re-exports.	Exports.	Re-exports.
	£'000	£'000	£'000	£'000	£'000	£'000
Russia	5,858	8,543	4,509	6,781	2,716	2,085
Finland	2,771	768	3,234	545	3,601	510
Sweden	8,052	1,289	9,654	1,029	9,715	1,243
Norway	6,916	567	7,455	504	7,939	449
Denmark,* with Faroe Islands	8,714	884	9,798	767	9,763	782
Poland, including Dantzic ...	2,471	912	5,319	849	5,253	829
Germany	26,352	20,922	41,879	27,538	40,950	26,414
Netherlands*	17,934	4,628	21,219	4,820	21,801	4,846
Java	5,728	85	6,059	94	7,014	109
Belgium*	14,266	8,100	16,471	8,779	17,003	10,344
France	20,384	20,224	23,634	18,456	23,169	18,553
Switzerland	6,194	1,637	7,645	1,373	7,923	1,311
Portugal*	3,364	589	3,888	428	3,741	358
Spain*	7,220	539	10,208	640	9,804	653
Italy,* including Fiume	10,500	1,960	13,488	2,240	14,354	2,118
Czechoslovakia	1,330	178	1,835	204	2,168	178
Greece	3,377	127	4,729	162	4,851	143
Roumania	2,612	86	2,682	107	2,989	72
Turkey, European and Asiatic, incl. Smyrna and Armenia...	3,103	108	3,180	106	2,735	144
Egypt	11,030	228	12,564	195	11,186	198
China†	16,409	242	9,690	120	15,718	135
Japan†	13,904	276	15,150	232	14,539	265
United States	49,116	25,835	45,437	21,438	46,624	22,112
Cuba	2,073	109	2,099	76	1,648	44
Mexico	2,772	54	2,200	34	2,802	54
Peru	2,349	81	2,087	75	1,955	85
Chile	5,666	279	5,183	228	5,120	258
Brazil	12,610	280	14,389	277	16,031	391
Uruguay	2,377	62	2,862	56	3,108	55
Argentine Republic	23,074	575	26,992	610	31,213	563
Other countries	37,669	1,645	46,892	2,146	46,426	2,283
<i>Total—Foreign Countries ...</i>	<i>336,195</i>	<i>101,812</i>	<i>382,431</i>	<i>100,909</i>	<i>395,868</i>	<i>97,584</i>
BRITISH POSSESSIONS.						
Irish Free State	34,758	10,417	36,200	9,366	35,136	9,639
British West Africa	11,733	1,360	14,690	1,450	14,827	1,651
Union of South Africa	32,164	1,640	30,502	1,533	31,674	1,605
British East Africa	4,483	159	4,648	125	5,019	136
British India, with Burmah ...	81,755	1,402	85,045	1,292	83,921	1,166
Straits Settlements and Federated Malay States ...	14,044	451	14,679	422	14,995	381
Ceylon and Dependencies	5,692	211	5,875	234	5,971	237
Australia	61,331	2,430	61,179	2,563	55,699	2,280
New Zealand	20,583	784	19,608	792	19,297	762
Canada	26,374	2,367	29,250	2,110	34,268	2,561
Brit. W. Indies, with Bahamas	4,022	302	4,528	251	5,113	325
Other Possessions	19,912	2,160	20,446	1,906	21,640	2,026
<i>Total—British Possessions</i>	<i>316,851</i>	<i>23,683</i>	<i>326,650</i>	<i>22,044</i>	<i>327,560</i>	<i>22,769</i>
Total—Foreign Countries and British Possessions ...	653,046	125,495	709,081	122,953	723,428	120,353

* Excluding colonies.

† Excluding Hong Kong, Macao, and leased territories.

‡ Including Formosa and leased territories; excluding Korea.

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THE LIMITS OF INDUSTRIAL EMPLOYMENT.

By E. C. SNOW, M.A., D.Sc.

[Read before the Royal Statistical Society, March 19, 1929, the President,
Mr. A. W. FLUX, C.B, in the Chair.]

THE object of this paper is to point out certain facts which are not apparent on the surface, but which in my opinion are of some importance in the study of the problem of unemployment in this country at the present time, and which afford a partial explanation of the inability of the industries of this country to absorb the labour available. Most industrialists resumed their occupations after the war under the impression that they were taking up the threads broken by the events of 1914-18, and with the expectancy that after a so-called "transition" period the favourable industrial circumstances of the first decade of the century would be repeated. It is a permanent trait with the bulk of mankind when circumstances seem favourable to them to assume the continuity of these circumstances. Not until a change has developed to a substantial extent do the majority of people begin to appreciate that a definite alteration in the circumstances has occurred and begin to adjust themselves to it. This was true to an appreciable degree in this country even when the change was so marked as the transition from peace to a war which ultimately became the greatest war of history. The new circumstances had developed considerably before a good proportion of the population in this country realized that the whole basis of their lives was changed. The industrial collapse in 1920 afforded another illustration of this trait. Employers generally appreciated only very slowly that a great change was taking place in some of the fundamental circumstances of industry, and the adjustments to the new circumstances were long delayed. If this be true of such changes as were of the order of catastrophes, it is

likely to be much more true when the change of circumstances is much slower and its manifestations not apparent on the surface.

The change, to some of the effects of which on industry attention is going to be called in this paper, is that which started in this country more than thirty years ago, when our birth-rate began to decline. At first the decline was slow, and its effect on the population was counterbalanced by other factors. The continuous and cumulative decline has now become so considerable that it has had a very definite though not an obvious effect on the population. Even among people who are generally well-informed it seems to be held that the fall in the birth-rate has been largely compensated for by a fall in the death-rate. This is very far from being the case, although the fact that our censuses have been taken at decennial periods and the last followed closely upon the war (which in itself produced great changes in the facts relating to the population) naturally accounts to some extent for the general lack of knowledge on this subject. It is probable that very few of those managing large industrial undertakings in this country realize the extent to which their activity is really dependent upon the growth of population. Many large businesses were built up in this country at a period when the population was increasing rapidly. A good proportion of these have found in the past few years that they seem to be perennially suffering from the effects of over-production. Many reasons for the lack of industrial expansion have been suggested, ranging from the constitution of the Directorate of the Bank of England to Bolshevism in Russia; but few seem to have troubled to enquire if there have been any changes in the growth of our population which might, at any rate partially, account for the change.

A little bit of theorizing may be helpful in indicating the nature of the problem before the facts are dealt with. The question which is to be explained is that of the effect on industry of a slackening in the rate of growth of the population which constitutes the market for consumers' goods. Industry has now become so complicated that it is easy to overlook simple fundamental facts. The most fundamental fact of all is that practically the whole of industry works to satisfy the requirements of mankind as regards food, clothing, etc. Many industries are concerned directly with the satisfaction of these requirements, and most other industries are concerned indirectly with it. In a self-contained community which was able to produce its own food, and also the materials required for clothing, etc., practically the whole of the population would be concerned with the production of goods for direct consumption. The less able a community is to provide these items directly, the bigger proportion of its industry must be concerned with the indirect

effort. In this country, for example, we have had to manufacture ships, bridges, railways, etc. for the purpose of developing countries overseas in order that they may provide the food and raw materials necessary for our physical welfare. The production of these implements of indirect consumption involves looking ahead a considerable time. The workman engaged in the fields is concerned in producing something which is consumed within the next twelve months. The workman engaged in manufacturing a bridge to be sent to a distant part of the earth in order to develop the country there so that food or raw material can be grown, is producing something which will not fulfil its purpose in satisfying human wants for years to come. There is a tacit assumption in this man's work that by the time it comes to fruition, the population will be sufficiently great to consume the additional goods which should be forthcoming. There is an underlying assumption in increasing the productive implements that the consumptive demand of the population will increase *pari passu*, and so take up the increased production which will be forthcoming.

The population in this country increased fairly rapidly in the second half of the eighteenth century. Gonner (*Journal of the R. Statistical Society*, February, 1913) gave the population of England and Wales in 1750 as 6,300,000, while at the census of 1801 it was 8,900,000—an increase of more than 40 per cent. in fifty years. He estimated the increase in the first twenty-five years of that period at 10 per cent. and in the second at 27 per cent. Since there have been official censuses in this country the decennial increase per cent. has been as follows:—

1801-1811	...	...	...	...	14.0
1811-1821	...	...	...	...	18.1
1821-1831	...	...	...	...	15.8
1831-1841	...	...	...	...	14.3
1841-1851	...	...	...	...	12.6
1851-1861	...	...	...	...	11.9
1861-1871	...	...	...	...	13.2
1871-1881	...	...	...	...	14.4
1881-1891	...	...	...	...	11.6
1891-1901	...	...	...	...	12.2
1901-1911	...	...	...	...	10.9
1911-1921	...	...	...	...	4.9

In the first half of the period we were practically self-supporting as regards food and many raw materials. Taking the estimate given by Wood in *The National Food Supply in Peace and War* (1917), that in 1909-13 we produced 40 per cent. of the food we consumed, we can assume that we were able to produce food enough

for a population of approximately 14,500,000 in England and Wales. Allowing something for improvement in the standard of living, we infer that it was about 1850, when our population in England and Wales was approximately 18,000,000, that we first became *dependent* upon exotic sources for the production of our food supplies. We were, of course, dependent upon external sources for some of our raw materials, notably cotton, long before. Details of the value of our imports before 1855 are not available, but our exports of commodities, after averaging £55,000,000 in the nine years to 1848, increased rapidly afterwards, and reached £100,000,000 in 1850-59 and £160,000,000 in 1860-69, and our imports no doubt followed a similar course of development. No particulars are available of the division of the exports into food, raw materials and manufactured articles, as this subdivision was not made in our official trade returns before 1890 (when 85 per cent. of our exports were manufactured articles), but the increase must have been almost entirely in manufactured articles, and the great proportion of it probably of capital goods for the development of overseas resources. These figures of trade confirm the evidence afforded by those of food supplies in fixing the middle of last century as approximately the date when it became essential to develop areas abroad in order to prepare the way for our future supplies of food and raw materials, and it was from about this date that the great developments in our basic construction industries began. Of course there had been some development in these industries before, just as there had been some import of food before, but the really substantial developments can be dated from this period.

The export of capital goods developed because there was considerable expectation that by the time they were fully employed the additional food supplies and raw material which would be forthcoming by their use would be required. This was a safe assumption at a time when it was clear that the population in, say, ten years after the export of the capital goods was going to show an increase of some millions. It is highly probable, however, that when once it was well under way the export of capital goods for the purpose of developing food and raw materials resources progressed at a greater rate than the actual demand for these latter classes of goods warranted. This is a logical inference from the fact that in almost every field of industry the productive capacity tends to develop more largely than the actual requirements demand, and it is supported by the fact that the return given on the capital employed in many development schemes has been extremely meagre. We can only expect continuous development in the demand for capital goods so long as we can foresee a continuous increase in the population.

With these general remarks I can now come to examine the facts on which the conclusions of this paper will be based. As certain estimates of future population must be given, a few comments on the subject will be useful. This subject was discussed by the present writer in papers contributed to the Society in 1911. Estimates of future population in age groups were also made for the purpose of the Dominions Royal Commission in 1913 when that Commission was discussing the problem of the population available for emigration. This was discussed also in a paper before the Society in 1915. Some assumptions are necessary in estimating future populations in age groups, and in the absence of any special information bearing upon the subject, the least unsatisfactory way is by means of the "survivor factor," which was illustrated in detail in the paper referred to (*Journal of the Royal Statistical Society*, March, 1915). In the estimates made for the Dominions Royal Commission in 1913, figures were given for 1931 based upon the data of the 1911 and earlier censuses. (It is of interest, now that we have much more information on the subject, to state that while the estimates made for the population in England and Wales over 15 were satisfactory, those for the population under 15 were much above what we now know will actually be the case. This is due to the impossibility of making any reliable assumptions concerning the future child population. The population under 15 has diminished much more than seemed likely fifteen years ago.) In making the population estimates for this paper—which refer to England and Wales and not to Great Britain—other data in addition to those provided by the decennial censuses have been employed. The Registrar-General of England and Wales now makes estimates, relating to the middle of each year, of the population in age groups for the whole country, based upon statistics of migration and other information he can obtain, and it happens to be convenient in working with the "survivor method" to use the Registrar-General's figures for 1926. The data afforded by his figures can be used for making estimates of the population in age groups for various dates up to 1941. If we consider the population of any age group, say 20-25, in 1921, the people in this group were in 1926 of ages 25-30; and therefore the "survivor factor" of people aged 20-25 over a five-year period can be computed. This "survivor factor" is then assumed to hold for the succeeding quinquennial period, so that given the population 20-25 in 1926, a figure can be computed for the population 25-30 in 1931. Estimates are obtained in this way for different age groups, and by use of the same "survivor factors" similar estimates can be computed applicable to 1936, and by repeating the process once more estimates can be made for each

age group for 1941, and this is as far as I feel justified in making computations. The "survivor factor" might more logically have been based upon populations determined at two actual enumerations of the population. The two which should be used are those of 1911 and 1921. The "survivor factor" for males deduced from this period, however, is obviously not applicable for use in estimating the future population because of the effect of the war. To go so far back as 1901-11 also seems unsatisfactory, as it is a long way removed from the present time. As the population in age groups for 1926 has been calculated by the Registrar-General on the basis of every available piece of information relating to births, deaths, migration and other data, no better material would appear to be available for the purpose of this paper.

In order that the estimates for 1931, 1936 and 1941 may be completed, some assumption is required regarding the population of ages 0-5 at each of these dates. The population at ages 0-5 in 1926 was larger than the corresponding population in 1921 (though the population in 1921 was less than the corresponding population in 1911) on account of the temporary increase in the birth-rate for a few years following the war. It is probable that a substantially lower figure will hold for the other dates mentioned, but I have taken certain round figures only slightly below those of 1926; *e.g.*, for males, 1,700,000, as against 1,723,000 for 1926 and 1,681,000 for 1921. If lower figures are taken the conclusions reached will be strengthened.* The estimates were made for five-year age groups

* The estimates of the population under 15 at 1926 are supported by the following figures showing the numbers of schoolchildren under 16 at various dates in England and Wales.

Date.	Elementary (000).	Secondary (000).	Total (000).
1911	6,040	145	6,185
1921	5,865	313	6,178
1922	5,820	330	6,150
1923	5,708	328	6,036
1924	5,609	322	5,931
1925	5,578	322	5,900
1926	5,592	330	5,922
1927	5,604	311	5,915

Sir Alfred Watson has kindly drawn my attention to his report (1928) to the President of the Board of Education on future numbers of children in Public Elementary Schools. Sir Alfred makes estimates on the basis of the present school attendance law of the numbers aged five and over on the registers of the Public Elementary Schools on the 31st March each year up to 1943, on the assumption that the annual number of births will be (a) 650,000, (b) 670,000 and (c) 700,000. On the first assumption there will be a decline from 5,432,000 in 1928 to 4,636,000 in 1943, and on the last assumption from 5,432,000 to 4,989,000.

and refer to mid-year dates, but the census figures before 1921 related to a date about the end of March.

For the purposes of discussion the detailed figures must be grouped in some way, and in Table I they are grouped in periods covering fifteen years each and taken back to the census of 1881. As the estimates in the quinquennial age groups may be of use for other purposes they are shown (together with the corresponding census populations of 1921) in Table A at the end of the paper.

Table I brings out a number of highly significant points. It is quite true that our total population is still increasing at an appreciable rate at the present time, nearly 200,000 people per annum. This figure, however, is much less than the yearly increase a generation ago, though it is more than apparently will be the case in ten years' time. The following summary indicates the annual increase at the mid-censal points, namely, 1886, 1896 and 1906, compared with the corresponding figure at the present time and the annual increase which it is estimated will hold in ten years' time.

England and Wales.

Annual increase of population at certain dates.

(000's omitted.)

Date.	Males.	Females.	Totals.
1886	140	160	300
1896	170	190	360
1906	170	180	350
At present time	100	90	190
Ten years hence	65	45	110

Significant as these figures are in showing the decline which has occurred in the rate of expansion of our home market, as an indication of the real development of that market they are misleading. People over, say, age 60 are certainly smaller consumers of most goods than are people of ages 15-45, and we must take into account the rate of increase of the different age groups in order to get a proper account of the expansion of the home market. The detailed figures in Table I show that the increase in the population at the present time and during the next ten years will be mainly among the older age groups. The population in the age group 0-15 is definitely below that of the last census.

The population in the age group 15-30 is increasing at the rate of 40,000 per annum for males, but is actually diminishing for females. The explanation of the increase in the case of males is that in 1921 the number of men who would have been of that age

TABLE I.

*England and Wales.**Actual or Estimated Populations in Age Groups 0-15, 15-30, etc.,
1881-1941.*

MALES (000's omitted).

Age Group.	1881.	1891.	1901.	1911.	1921.	1926.	1931.	1936.	1941.
0-15 ...	4,740	5,090	5,270	5,520	5,280	5,080	4,950	4,980	4,930
15-30 ...	3,380	3,840	4,410	4,610	4,820	4,890	5,100	4,930	4,730
30-45 ...	2,250	2,600	3,090	3,780	3,780	3,770	3,830	4,130	4,480
45-60 ...	1,430	1,610	1,900	2,300	2,910	3,160	3,280	3,280	3,260
60-75 ...	710	750	860	1,070	1,330	1,520	1,720	1,960	2,110
Over 75 ...	110	140	170	190	250	280	320	360	410
Total ...	12,620	14,080	15,700	17,420	18,070	19,700	19,200	19,600	19,920

FEMALES (000's omitted).

0-15 ...	4,740	5,080	5,290	5,510	5,210	4,980	4,840	4,860	4,810
15-30 ...	3,550	4,120	4,780	4,970	5,100	5,190	5,130	4,910	4,690
30-45 ...	2,430	2,780	3,360	4,020	4,370	4,450	4,570	4,690	4,770
45-60 ...	1,560	1,770	2,050	2,490	3,140	3,190	3,750	3,870	3,970
60-75 ...	850	910	1,070	1,290	1,590	1,750	2,020	2,390	2,620
Over 75 ...	170	210	250	310	410	410	490	510	610
Total ...	13,300	14,900	16,800	18,580	19,810	20,370	20,520	21,260	21,800

was considerably reduced by reason of the war, but since that date there has been a considerable accession to the age group through the people who were too young to be in that age group in 1921. The male population 30-45 is increasing at the rate of about 12,000 per annum, and the female population at the rate of 18,000 per annum. The population at higher ages, however, is increasing much more rapidly, in spite of the fact that the actual size of the population at higher ages is considerably smaller. The female population between 45 and 60, for example, is increasing by 52,000 per annum, or at the rate of nearly 16 per cent. in ten years. The male population is increasing by 24,000 per annum, or at the rate of nearly 8 per cent. in ten years. At higher ages still the rate of increase is even greater. The statement frequently made that our population is still increasing at a substantial rate misdescribes the true position. At the present time the position can be best summarized as a decline in the child population, a stationary population for youths and young people, and an increase in the middle-aged and old people, the last-named increase being greater than the decrease in the number of children. Looking ahead, the estimates made for the position ten years hence indicate that although there will be some annual increase in the total male population, this will be almost entirely due to the population over 60. There will be no increase for females up to age 60, and we can count upon a substantial decrease in the important group 15-30. The same general statement will be true for males, except that in the group 30-45, owing

to the effects of the war previously referred to, there will be a not inconsiderable, but temporary, increase.*

I think the figures set out in Table I are worthy of the closest attention by sociologists and those studying industrial problems in this country. Nearly all occupied people can be classified under one or other of four headings :—

(A) Those producing goods for early consumption, *e.g.* food, boots, etc.

(B) Those producing capital goods, *e.g.* ships, machinery, etc., which will later on help to increase production of consumers' goods under A.

(C) Those producing luxury or semi-luxury goods, the demand for which depends more on increase in the purchasing power of the individual than on increase in the number of individuals; *e.g.* gramophones, private motor-cars, etc.

(D) Occupations auxiliary to the above, *e.g.* transport necessary to get workers from their homes to factories, public utility services, etc.

In present circumstances we cannot expect the groups of occupations comprised under heading (A) to absorb labour to any great extent. Increased specialization and improved machinery tends towards the production of a larger amount of goods from the same number or even fewer work-people. The requirements of the small increase in population now taking place can very largely be met without any increase in the numbers employed in these occupations. (An example of this is given later.)

But it is in the occupations comprised in Group B that the most serious consequences on employment would be expected to arise as a result of the slackening in the growth of population. Owing to that slackening we do not need new factories or new machinery or equipment at the same rate as before. This means a definite cutting off of employment in building and the machinery trades. This in its turn involves diminution in the output of metals. A smaller quantity of fuel is required, and this in turn affects employment in transport. The reduction in employment among those engaged in producing capital goods reduces their purchasing power

* Sir A. Watson has pointed out to me that the discrepancy between the increases for males and females for separate age groups may be, at least partially, due to misstatements of ages at the census. These misstatements are known to be more numerous in certain groups than in others. Thus, while the number of females in the age group 10–15 at one census is probably fairly accurately stated, the number 20–25 at the next census is inflated by misstatements of age.

for consumers' goods, and thus employment in the occupations in Group A is affected, and so the circle continues.

The argument is not affected by the fact that many in the Group B occupations are engaged on the production of goods for export. If, owing to the slackening in the rate of growth of population, there is a corresponding slackening in the demand for imported food-stuff, there is a corresponding reduction in the rate of opening up of new areas abroad, and this reacts on the quantity of capital goods made by those in the Group B occupations which are required. It is no use opening up new areas if, by the time these are productive, the population has not increased sufficiently to absorb the increased production.

In the circumstances it is not surprising to find that it is the occupations in Group B which have suffered most severely from unemployment. Of course there are many other factors which operate to mitigate the effects described, notably the development of industries in Group C. All I am concerned with here, however, is to describe the effect of certain factors affecting employment, without enquiring if there are other factors which alleviate those effects.

In order to give more concrete expression to the idea of the effective consuming power of a population, it seems worth while to try to express in some way the relative consumption demand of the populations in the various age groups, in order to build up an indication of the total consumers' market. For this purpose what are required are indices indicating the variation in the demand for consumers' goods according to age. There are no general statistics bearing upon this point, and obviously each enquirer is likely to form a different opinion as to what the distribution should be. So far as food is concerned, some figures of the requirements of individuals at various stages of life have been worked up by experts. In the pamphlet by Professor Wood on *The National Food Supply in Peace and War* previously referred to, the various food requirements at different ages have been given as follows :—

Ages.					Relative Food Requirements.
0- 5	...	...	...	...	0.4
6- 9	...	...	...	...	0.5
10-13	...	...	...	...	0.6
14-15	{	Males	...	...	0.8
		Females	...	...	0.7
16 and above	{	Males	...	...	1.0
		Females	...	...	0.8

This rule of variation of consumption with age is certainly not applicable to consumers' goods in general. The impression of those

selling clothes, boots, etc. is that customers between 20 and 40 are the biggest consumers, and I have chosen my curve showing the rate of variation of general economic consuming power with age on the following principles. It should start from zero at age 0, then rise to a maximum at some age, and then fall off again to zero at the end of life. Round about the point of maximum consumption it is probable that the variation will be small over a considerable number of years, that is, the curve should be almost horizontal over a considerable range. I have taken the age of maximum consumption to be 30. This has been taken partly on the ground of general impressions, partly for statistical convenience, and partly on account of the fact that the physical prime of man has been shown to be at about age 28. It probably does not affect the conclusions very much whether this age is changed five years one way or the other. For statistical convenience, also, I have taken the final age as 90.*

We have previously used the age groups, 0-15, 15-30, 30-45, 45-60, 60-75 and 75-90, so that we require to divide the area bounded by the curve up into six parts of equal horizontal range and find the mean ordinate of each variation. If we take unity to represent the maximum individual consumption demand, the average consumption demand of individuals in the various groups is found to be as follows:—

0-15	...	...	...	...	0.19
15-30	...	...	..	...	0.81
30-45	...	...	...	...	0.95
45-60	...	...	...	...	0.68
60-75	...	...	...	...	0.32
75-90	...	...	...	...	0.06

It will be easy, of course, to criticize these figures, and no doubt some will claim that the indices given for old people are too low, bearing in mind the fact that old age pensions are now general in this country, while others may claim the reverse. It is probable, however, that the general trend of the figures approximately represents the facts, and as they are given for illustrative purposes only, it does not matter much if other figures of the same general trend

* This curve is really constituted by two separate curves, and their equations are easily worked out on the assumption that the tangent at the maximum point in each case is horizontal, and that one starts at zero at age 0 and the other at age 90. Taking the origin at age 30 for both curves, the equation of the left-hand curve is

$$y = y_0(1 - 3x^2 + 2x^3),$$

and of the right-hand curve is

$$y = y_0(1 - \frac{3}{2}x^2 + \frac{1}{2}x^3).$$

are used. These figures represent a series of consumption indices for the various age groups, and from them a series of numbers representing the total consumptive power of the population in each group at various dates can be obtained. As these numbers may be of some interest they are given in detail in Table II for each age group. The number stated against a particular age group represents the equivalent number of people of maximum consumption demand in that group. Thus, referring to the 1921 male group 15-30, the number of individuals was (Table I) 4,520,000; but the equivalent number of people of maximum consumption demand was 3,661,000. From the data given in Table II we obtain the following series of figures representing the size of the market in this country for consumers' goods at various dates:—

Date.				Males (000's omitted)	Females (000's omitted)	Total (000's omitted)
1881	...	...	...	6,980	7,430	14,410
1891	...	...	...	7,890	8,460	16,350
1901	...	...	...	9,080	9,820	18,900
1911	...	...	...	10,240	11,010	21,250
1921	...	...	...	10,670	11,940	22,610
1926	...	...	...	11,160	12,380	23,540
1931	...	...	...	11,510	12,660	24,170
1936	...	...	...	11,720	12,780	24,500
1941	...	..	...	11,940	12,820	24,760

To illustrate the meaning of these figures; the total population of females in 1921 (Table I) was 19,810,000, and if they had all been about the age of maximum consumption demand, this figure would have represented the female market for consumers' goods. When allowance is made, however, for the variation in age of the individuals, the figure representing the aggregate female consuming power is 11,940,000. The actual population of 19,810,000 was equivalent to one of 11,940,000 females of maximum consumption demand.

It is to the figures above that I wish to draw particular attention. The actual population figures may be misleading in discussing the problem of economic demand, owing to change in age distribution, but these figures corrected for age distribution show in an approximate manner the change in the size of the home market for consumers' goods from 1881 to 1941. Taking the actual rate of increase between each of the consecutive dates named as representing the increase of the consuming market at dates midway between the named dates, we see that in 1886 the market was increasing by 190,000 a year; in 1896 by 260,000 a year, and in 1906 by 240,000 a year. At the present time it is increasing at the rate of only

TABLE II.

England and Wales.

Populations in Age Groups in Table I, adjusted to indicate Corresponding Number of Persons of Maximum Consumption Demand.

MALES (000's omitted).

Age Group.	Average Consumption Index.	1881.	1891.	1901.	1911.	1921.	1926.	1931.	1936.	1941.
0-15 ...	0.19	901	967	1,001	1,049	1,003	965	940	912	937
15-30 ...	0.81	2,738	3,110	3,572	3,731	3,661	3,961	4,131	3,903	3,931
30-45 ...	0.93	2,137	2,470	2,935	3,543	3,591	3,561	3,638	3,923	4,256
45-60 ...	0.68	972	1,093	1,292	1,561	1,979	2,140	2,230	2,217	2,217
60-75 ...	0.32	227	240	275	343	426	486	550	627	675
Over 75 ...	0.06	7	8	10	11	15	17	19	22	25
Total ...		6,982	7,890	9,085	10,243	10,075	11,159	11,508	11,724	11,941
FEMALES (000's omitted).										
0-15 ...	0.19	901	965	1,005	1,017	990	949	920	923	920
15-30 ...	0.81	2,875	3,337	3,572	4,026	4,131	4,204	4,171	3,977	3,799
30-45 ...	0.93	2,305	2,641	3,192	3,810	4,151	4,256	4,341	4,155	4,593
45-60 ...	0.68	1,061	1,204	1,394	1,693	2,135	2,373	2,550	2,632	2,700
60-75 ...	0.32	272	301	342	410	500	573	648	705	833
Over 75 ...	0.06	10	13	15	19	24	26	29	32	37
Total ...		7,427	8,461	9,820	11,014	11,940	12,880	12,657	12,784	12,825

120,000 a year, and in ten years' time it will be increasing by only 50,000 a year, or one-fifth of the increase twenty years ago. Even this last figure may ultimately be found to be higher than is actually the case in view of the fact that the population figures 0-15 used for 1931, 1936 and 1941 may be found to be too large.

The figures, however, do emphasize in a definite manner that the economic circumstances of our home market are in the next few years going to be entirely different from what they were twenty to thirty years ago, and I believe that this fact alone has a very important bearing upon our present industrial difficulties. In the first place, it is clear that there can be little elasticity for those industries producing consumption goods in existing circumstances unless they have some special opportunities for export development which very few, if any of them, have. For some decades they have catered for a market expanding by 10 or 12 per cent. in a decade. Most of them found their market during the four years of the war artificially enlarged at an even greater rate. Now it is increasing at only 5 per cent. in a decade, and in ten years may hardly be increasing at all. The figures indicate that the position described would certainly have arisen even had there been no war. The extension of industries for war purposes has no doubt

aggravated matters, and the habit of attributing our troubles to the consequences of the war has also prevented our seeing and appreciating the actual facts as soon as otherwise would have been the case. We have reached a stage in the population development which requires to be seriously faced by those in charge of our industries. Every industry possesses a number of enterprising firms who wish to expand. When the population was expanding rapidly they were able to do so without seriously feeling the effects of over-production. They probably did over-produce, but before this became noticeable the enlargement in the market caused by an increased population absorbed the goods. In recent years the same spirit of enterprise has prevailed, and producers are probably more efficient than they were a generation ago, but with a market expanding only very sluggishly the goods are not readily absorbed and over-production becomes evident, and the attempt to get the excessive supply of goods absorbed creates difficulties which have serious consequences to industry over a prolonged period. The tendency to excessive production in industry is probably as definite a law as that of diminished returns in agriculture.

It is logical that those industries whose function is to provide equipment for the production or transportation of food and raw materials for our home population should first feel the effects of a contracting market and to the greatest extent. These effects may be postponed if other countries with expanding populations require to import increased supplies of food and raw materials. The countries from which we get the bulk of our supplies of food and raw materials (the Empire countries and Argentine) are probably well enough equipped with capital goods to provide for the increased supply of these materials which this country, at any rate, seems likely to want for the next twenty years and probably longer. Repairs and renewals of that equipment will, of course, be needed, and the work involved in this is really quite substantial, and in itself will maintain a good proportion of the heavy industries in this country in employment. In particular the development of the electrical industries requires an increasing number of employees year by year. To a large extent, however, their work is that of replacing obsolete equipment, means of transport, etc. with modern equipment. When this replacement is complete, the fact that the population will be practically stationary and the demand for additional equipment will be small, will probably have the same effect on the electrical industries as it has already on the shipbuilding industry. Even if our heavy industries had not had to meet new forms of competition consequent upon the development of similar industries in other countries, it is difficult to see how they could

have maintained themselves at the magnitude at which they were a few years ago.

An example can readily be given indicating how the decline in the rate of expansion of the population, causing a corresponding slackening in the rate of expansion of the demand for consumers' goods, affects the basic construction industries. In the case of the sole leather industry, for example, the increased output of leather required necessitated for many years the building of two new tanneries per year, or the equivalent in extensions to existing tanneries, and this provided appreciable employment in a number of industries. No more new buildings or extensions are really needed for the purpose of producing the output required (in fact, too much in this direction has been done, and over-production with its serious consequences has been the result), and the men—builders, machinery constructors, metal workers, etc.—who in the past have found employment in this way have to get other employment or be unemployed. The same is true of other industries producing consumers' goods, and the aggregate effect upon the basic construction industries must already have been substantial and will probably be more in the next decade. The effects on employment have been mitigated, however, by the fact that new industries have required buildings and equipment. Some of these industries themselves produce consumers' goods—*e.g.* artificial silk taking the place of other textiles—but it is not a rash forecast to express the opinion that these industries will fairly quickly catch up the demand for their products, and when they have done so will have to face the same facts regarding the decline in the rate of expansion of the market for their goods as the older industries have done.

Those occupations, such as transport, fuel, etc., which are directly dependent to a large extent upon the prosperity of the manufacturing industries must naturally be adversely affected by the slowing down of the rate of increase of the population, and the effects tend to be cumulative. Unemployment in the basic construction industries reduces the demand on the consumption industries, which in turn reduces the demand by those industries for capital goods, which in turn again reduces the quantity of goods to be carried on the railways, which reduces the quantity of fuel required, and so on. Just as in a period of rapidly expanding markets an increase of production in one industry begets work in another industry, and nothing seems to stand in the way of all-round expansion, so when the markets cease to expand, or expand only very slowly, difficulty begets difficulty, and troubles appear at every turn. While markets are expanding there is a tendency to attribute success to personal ability or to general policy, when it would probably be more correct

to give a much greater proportion of the responsibility to the expanding market. It is probably not so much the factors over which the individual has control which make for success or failure in industry, as such factors as the expanding or declining demand for his products, over which he has little or no control.

In the matter of markets, however, industries in different countries are not altogether independent. If, while our own market was declining in its rate of expansion, markets in many other countries were increasing rapidly, the economic effect of our slackening would be diminished. I do not propose here to enter into a discussion on the facts of population in other countries in the detail with which I have discussed them for this country; but it is clear that in a general way the position is similar in many other European countries. In Mr. De Jastrzebski's paper on "Changes in Sex and Age Constitutions of some Representative European Populations," in Part II of the *Journal* for last year (p. 231), tables are given of population in age groups in the six countries, Belgium, Germany, Great Britain, the Netherlands, Sweden and Switzerland, at the dates of the last three decennial censuses, approximately 1900, 1910 and 1920. The tables do not show the actual numbers in each group, but only the proportions per 10,000 of the totals, but they enable a comparison to be readily made of the position in the five other countries with that in Great Britain. In Great Britain in 1921 the population in the age group 20-30 and all groups below it was declining, while in the age group 30-40 and in all higher groups it was increasing. The turning-point between decline and expansion in the British population in 1921 may be said, therefore, to be between the age groups 20-30 and 30-40. For Belgium, looked at in the same way, the turning-point of the figures was between the groups 10-15 and 15-20, while it was the same also for Germany and Holland. In Sweden and Switzerland it was five years earlier. These facts seem to indicate, but do not prove, that the same sequence of events is coming in the continental countries referred to, but is lagging about fifteen to twenty years behind the sequence here. The rate of expansion of the market for consumption goods in the continental countries named is apparently not yet declining to the extent that it is in this country; but within the next twenty years these continental countries will probably pass through a similar experience.

The facts regarding population set out above have an important bearing on the effect of the development of labour-saving appliances in industry. It has been an axiom of orthodox economics that the effects of new labour-saving devices leading to the production of the same amount of goods of some particular character with a diminished

amount of labour, and thus leading to some unemployment, are temporary only. The theory is that this displaced labour is fairly quickly absorbed in other employment, to some extent at any rate, directly or indirectly stimulated by the extra purchasing power brought about by the new labour-saving devices. Even though the mobility of labour in this country is sluggish in comparison with that, for example, in the United States, the experience of the industrial epoch from the middle of the last century up to the outbreak of the war supports the theory pretty well. Labour was continuously being displaced from one occupation and absorbed in another, or even in another branch of the same occupation. May not this have been mainly brought about, however, by the fact that our market was increasing rapidly throughout the period due to the rapid increase of population? Is it justifiable to assume that the introduction of large labour-saving devices in an industrial community which was practically stationary would have the same effects upon the employment of labour as in a period of rapidly increasing population? The full examination of the data bearing upon this subject would be worth a paper in itself. The general reduction of working hours to 48 per week has to some extent hidden the effect of anything that has been going on in recent years in the direction of displacing labour due to labour-saving devices. There is a tendency to look upon the establishment of the 48-hour week as a concession forced by a revolutionary proletariat following the war; but in this country at any rate there seems reason to believe that economic forces would have led to its establishment (though perhaps not so generally as is actually the case) even had there been no war.

The case of the boot industry may be cited to illustrate the effect on employment in industry of the continual development of labour-saving devices. To those connected in any way with the industry the fact that the output has been considerably expanded with a diminution in the number of employees is well known. The decline in the number of people employed in the boot industry was apparently sufficiently noteworthy for the compilers of the general report of the census of England and Wales in 1911 to make special enquiries, and they referred in that report to the association of "greatly increased output" with "actual decline now recorded in the numbers employed." Since that date the association has probably become even more marked. The statistics indicating the association, however, are extremely complex and do not enable a simple mathematical comparison to be made. Some of the figures bearing upon the subject are dealt with in a footnote below,* and a

* The total numbers employed in the manufacture of boots, shoes and clogs in Great Britain, excluding employers and managers, but including repairers

detailed examination of all the available evidence has led me to the conclusion that whereas in 1907 the operatives in the industry

as well as certain classes of employees such as packers and warehousemen who are not engaged in actual production, at the last three censuses were :

1901	...	...	...	237,000
1911	...	...	...	218,000
1921	...	...	...	200,000

The 1921 figure was compiled on an industrial basis; that is to say, everybody who returned themselves as being employed in connection with boot manufacturing, boot repairing, etc. was included. At the previous two censuses the return was made on an occupational basis; that is to say, those who returned themselves as labourers or clerks but did not refer specifically to a boot factory were not included in the figures. It is probable, therefore, that the figure stated for 1921, namely, 200,000, is greater than would have been the case had the 1921 figure been compiled on exactly the same basis as those for 1901 and 1911. A detailed examination of the figures for 1921 suggests that there were 10,000 individuals included in the figure of 200,000 who would not have been included in boot manufacture, etc. at the earlier censuses.

At first sight the statement in the text seems to be at variance with the figures given in the Report of the 1924 Census of Production of Great Britain in the boot industry (*Board of Trade Journal*, March 3, 1927). This report gives not only the actual output but also the number of persons employed, and appears to indicate an increase of nearly 20 per cent. in the numbers between 1907 and 1924. It is stated in the report itself, however, that the figures are not comparable and that the 1924 figure included more people working on repairs than did the 1907 figure. As there was considerable development between 1907 and 1924 in the direction of repairs in workshops, it is highly probable that a considerable number of people who were actually engaged in factories on repairs in 1924 were included in the census, but the corresponding people when working in their own houses had been omitted in the 1907 figure. The census of production returns should be the ideal method by which a comparison of the nature we are making could be made, but it is clear from the reasons stated that this comparison is not valid. This view is further supported by the particulars given in the Census of Production of the development of power.

It is probable that the relative decline in the numbers between 1907 and 1924—the dates of the two Censuses of Production—is even greater than is indicated by the comparison of the figures for the three censuses of 1901, 1911 and 1921. There is reason for the view that at the census of 1921 many were included who worked in the industry in the boom period up to the autumn of 1920 but never returned to it after the slump. Unemployment in the industry reached its maximum, 12·3 per cent., in December, 1920, and in the census of 1921 there must have been many who returned themselves as belonging to the boot industry but who never actually worked again in it. The number of members of the boot operatives' trade union in 1920 was 89,000, in 1922 it was down to 75,000 and in 1928 it was 80,000. There may, of course, have been variations in the proportion of work-people in the union, but there are special reasons in the boot industry tending to keep the proportion fairly steady. Although the statistical analysis is very complex, I believe that the comparison which I have given above of the decline in employment in comparison with the increase in output understates rather than overstates the actual facts.

working on the average probably at least 50 hours per week produced in Great Britain 97 million pairs of boots, etc., in 1924 a considerably smaller number of operatives (possibly 20 per cent. smaller than in 1907) working on the average 40 hours per week produced 117 million pairs.

In the leather-producing industry, as a further example, the quantitative measure of the output increased by 20 per cent. between 1907 and 1924, but the number of employees increased by only 6 per cent. As the working hours declined by at least 10 per cent., the same number of men working the same number of hours in 1924 would have produced about 25 per cent. more than in 1907.

The point I wish to make is that, owing to the slackening in the elasticity of our industry generally, arising from the facts regarding population previously described, the chances of the operatives displaced in an industry being absorbed in another is steadily declining. The effect is cumulative, the inability of other industries to absorb the surplus labour resulting in a further diminution in consumers' demand. It is probable that labour-saving machinery is displacing labour at the present time at as great a rate as it ever *has* done, particularly in certain industries. At an epoch when the absorption of this displaced labour is difficult, a country which is dependent, as much as this is, on manufacturing and allied industries for the employment of its population will naturally be in a worse position than countries in which manufacture plays a less prominent part in the total life of the community. It is of interest, therefore, to examine certain figures bearing upon this aspect of the matter, both for this and for other countries. In the examination the question of an increase in the employment of women may be important, and the figures analysed will touch upon this point.

The percentages of the population over 15 occupied in employment in Great Britain, France and the United States at the census of 1920 or 1921 compared with the percentages at the census of 1910 or 1911 were as follows :—

MALES.					
			Great Brit un.	France.	United States.
1910 (11)	...	...	93·8	90·1	91·1
1920 (21)	...	...	93·4	90·7	90·0
FEMALES.					
1910 (11)	...	...	34·7	49·9	25·5
1920 (21)	...	...	33·1	52·1	24·0

This comparison certainly shows the European population (and

particularly our own) in a more favourable light from the point of view of "work" than our friendly critics on the other side of the Atlantic are generally willing to concede. The comparison, however, is too general to warrant any particular inference being drawn from it.

The most useful form of comparison of the position in different countries is that between corresponding groups of occupations. On the whole the census classifications used in the countries referred to are similar and a useful comparison can be made. It should be borne in mind, however, that the figures are not collected on a common basis, and some individuals may in one country be included in one occupation group who in another country would be classified under another group. As the groups, however, are well defined, there is probably not much serious error arising from this cause.

The summarized industrial distribution of the occupations of the population in England and Wales in 1921 are given below.

(The figures embrace all persons engaged in each particular industrial group, including maintenance staff, clerks, carmen, and certain other occupations.)

England and Wales, 1921.

Industrial Group Occupation.	MALES.		FEMALES.	
	No. (000).	Proportion per 1000 occupied.	No. (000).	Proportion per 1000 occupied.
Fishing and Agriculture	1,077	89	87	17
Mining and Quarrying	1,223	101	9	2
Manufacturing Industries (including Building)	4,777	394	1,956	386
Transport and Communications	1,164	96	39	8
Commerce and Finance	1,533	127	742	146
Public Service	1,139	94	359	71
Professional	272	22	243	48
Personal Service (including Entertainment and Sport)	604	50	1,564	309
Other industries and industries not stated	321	27	67	13
Total	12,110	1,000	5,066	1,000

It is not practical to show the corresponding distribution for the 1911 census in the same form, but a number of items can be given from the table prepared by the Registrar-General for England and Wales for the Committee on Industry and Trade, and published in the General Report on the census of 1921.

England and Wales, 1911.

Occupation.	Males.		Females.	
	No. (000).	Proportion per 1000 occupied.	No. (000).	Proportion per 1000 occupied.
Fishing and Agriculture	1,164	102	95	20
Mining and Quarrying	1,080	95	4	1
Manufacturing Industries (including Building)	4,380	383	1,680	399
Transport and Communications ...	1,108	97	20	4
Public Service	801	70	210	44
Personal Service	700	61	1,930	400
All others	2,221	192	692	142
Total	11,454	1,000	4,331	1,000

The points of interest to be drawn from these tables for our present purposes are :—

1. The proportion of our occupied male population engaged in manufacturing industries is practically 40 per cent., and showed only a small increase between 1911 and 1921.

2. The proportion of our occupied male population in agriculture is less than 9 per cent., and declined between 1911 and 1921.

3. The proportion in mining and quarrying industries, largely dependent upon activity in manufactures, was 10 per cent., and was increasing.

4. The proportion engaged in transport and communications and industries, also largely dependent upon manufacturing activity, was also about 10 per cent.

In all, therefore, about 60 per cent. of our occupied male population is engaged in manufacturing or in industries which depend very largely for their prosperity on manufacturing activity.

The increase in the number of occupied women between 1911 and 1921 was surprisingly small, being only 230,000 as against an increase of 660,000 in the case of men. Personal service in the case of females declined by 370,000 (compared with 100,000 for men), so that the total increase of female employment in non-personal work was 600,000, but only 80,000 of this figure was in manufacturing industries. The proportion of women occupied in manufacturing industries remained constant and about the same as the proportion for men. These figures do not indicate that increase of employment of women in manufacturing work has had any serious effect upon the problem of the unemployment of men.

The census particulars of occupations for the United States are

not available in quite the same form as the above figures for England and Wales; but a fairly good comparison can be made. Separate groups are given in the United States' returns for "Trade" and "Clerical." The former would be included under "Commerce and Finance" in the England and Wales figures, while, as pointed out before, the "Clerical" occupations in England and Wales are included with the industrial group to which they belong. The table prepared by the Registrar-General for England and Wales for the Board of Trade Committee on Industry and Trade previously referred to, however, shows that for 1911 the inclusion of maintenance staff, clerks, carmen and certain other occupations common to all industries increased the proportion engaged in manufacturing industries (including building) only from 370 per 1000 total occupied to 377 per 1000. In spite of the different bases of compilation, therefore, the British and the American figures can be fairly reliably compared. The American figures are as follows:—

United States, 1920.

Occupation.	MALES.		FEMALES.	
	No. (000).	Proportion per 1000 occupied.	No. (000).	Proportion per 1000 occupied.
Agriculture, Forestry and Animal Husbandry	9,869	298	1,084	127
Extractive Minerals	1,087	33	3	0
Manufacture and Mechanical industries (including Building) ...	10,888	331	1,930	226
Transport	2,850	86	213	25
Trade	3,575	108	668	78
Public Service	748	23	22	3
Professions	1,127	34	1,016	119
Domestic and Personal	1,218	37	2,187	256
Clerical	1,700	51	1,426	167
All occupied	33,064	1,000	8,549	1,000

United States, 1910.

Agriculture, Forestry and Animal Husbandry	10,852	361	1,808	224
Extractive Minerals	964	32	1	0
Manufacture and Mechanical industry (including Building) ...	8,838	294	1,821	226
Transport	2,531	84	107	13
Trade	3,147	104	468	58
Public Service	446	15	14	2
Professions	930	31	734	91
Domestic and Personal	1,241	41	2,531	313
Clerical	1,143	38	593	73
All occupied	30,092	1000	8,077	1,000

In spite of an increase of 3,000,000 occupied men between 1910 and 1920 the number in agriculture, etc. at the latter date was 1,000,000 fewer than at the earlier one. At the time of the United States census of 1920, however, industry was booming in that country, while agriculture was greatly depressed, and the population census figures were probably affected by these facts. The proportion of males in manufacturing industries increased from 1910 to 1920, but even at the latter date and at a boom time, the percentage of the total occupied was only 33 (against 40 per cent. in this country in 1921, at a time when industry was greatly depressed). Taking the manufacturing industries, together with other manual industries largely dependent upon them, namely, extractive industries and transport, the total proportion is only 45 per cent. against 60 per cent. in England and Wales. The latter figure may be swollen a little by the fact that the clerical staff is included, but, on the other hand, in comparison with the United States figure, the fact that the United States census was at a time of manufacturing boom and the census of England and Wales at a time of manufacturing depression probably counterbalances this.

The occupational figures for France can be put in a form fairly similar to those of the United States. The figures for 1921 and 1911 were:—

France, 1921.

Occupation.	MALES.		FEMALES.	
	No. (1000).	Proportion per 1000 occupied.	No. (000).	Proportion per 1000 occupied.
Fishing, Forestry and Agriculture	4,911	392	3,821	460
Extractive Minerals	269	21	7	1
Manufacturing Industries	3,825	306	2,084	251
Transport	862	69	268	32
Trade	1,215	97	957	115
Professions	291	23	276	33
Domestic and Personal	145	12	678	82
Public Service	1,011	81	222	27
All occupied	12,531	1,000	8,313	1,000

France, 1911.

Fishing, Forestry and Agriculture	5,330	425	3,241	420
Extractive Minerals	240	20	6	1
Manufacturing Industries	3,554	283	2,192	284
Transport	1,157	92	337	43
Trade	1,218	96	835	108
Professions	396	32	154	20
Domestic and Personal	159	12	771	100
Public Service	492	40	183	24
All occupied	12,545	1,000	7,719	1,000

The classifications employed at the two censuses were not exactly the same. The French population at the time of the 1921 census (March) was probably farther removed from its normal state, through disturbance by the war, than that of either England and Wales or the United States. A decline in the number of men employed in agriculture was accompanied by a big increase in the number of women so occupied. The proportion of the occupied men engaged in manufacturing industries was about 30 per cent., compared with 40 per cent. in agriculture. Taking, as before, those manual occupations directly associated with manufacturing industries, *e.g.* extractive industries and transport, the total proportion is about 40 per cent. as against 45 per cent. in the case of the United States and 60 per cent. in England and Wales.

Comparable statistics for Germany are not provided by the census of population. Figures are collected, however, at the industrial censuses taken at different dates, and the following figures (taken from the *International Statistical Year Book* published by the League of Nations) compare the position in 1907 with that in 1925.

Germany, 1907.

Occupation.	MALES.		FEMALES.	
	No. (000).	Proportion per 1000 occupied.	No. (000).	Proportion per 1000 occupied.
Fishing, Forestry and Agriculture	5,284	284	4,599	485
Extractive Minerals	1,182	64	26	3
Manufacturing Industries	7,970	429	2,078	219
Transport	983	53	43	4
Trade	1,563	84	888	94
Professions	422	23	275	29
Domestic and Personal	52	3	1,529	161
Public Service	1,028	55	13	1
Other Industries and Industries not Specified	115	6	42	4
All occupied	18,599	1,000	9,493	1,000

Germany, 1925.

Fishing, Forestry and Agriculture	4,793	234	4,969	433
Extractive Minerals	1,018	50	18	2
Manufacturing Industries	9,312	454	2,890	252
Transport	1,423	69	97	9
Trade	2,275	111	1,478	129
Professions	773	38	528	46
Domestic and Personal	37	2	1,357	118
Public Service	732	36	58	6
Other Industries and Industries not Specified	168	8	82	7
All occupied	20,531	1,000	11,478	1,000

The German post-war figures refer to a different area from the pre-war ones. The extractive, manufacturing and transport industries accounted for 67·3 per cent. of the occupied males in 1925 as compared with 54·6 per cent. in 1907.

A convenient summary of the male portions of the above tables is as follows :—

	Proportion in Agri- culture, etc.	Proportion in Minerals, Manufacture and Transport.	Proportion in other Occupations.	Total.
England and Wales (1921) ...	89	591	320	1,000
United States (1920) ...	298	450	252	1,000
France (1921) ...	392	396	212	1,000
Germany (1925) ...	234	573	193	1,000

The great extent to which we have become dependent upon manufacturing and allied occupations for the employment of our male population is well brought out by these figures. The other countries employ, proportionally, three to five times as many men in agriculture, etc. as we do. If the idea developed earlier in this paper is sound, namely, that the slackening in the rate of growth of the population is partially responsible for the development of unemployment (assuming that those included in the second column, when thrown out of work, are of training and education which enables only a small proportion of them to be absorbed into the occupations included in the third column), then unemployment would naturally be more acutely felt in a country in which the only other "manual" occupation engages less than 9 per cent. of the population than in countries where these other occupations engage from 25 to 40 per cent. Clearly the circumstances of agriculture in this country do not enable it to absorb any of our unemployed workmen, but even if it did, the dimensions of the figures show that agriculture could, at the best, only go a small way to reduce the unemployment. The percentage unemployed in this country in the group of industries represented by Column 2 is about 12 per cent., being about 860,000 men on the basis of the 1921 census figures. This is no less than 80 per cent. of the total number of men in agriculture, etc. at the same date. But if 12 per cent. of those engaged in the same industries were unemployed in the United States, representing approximately 1,780,000 men, these unemployed would on the basis of the 1920 census be only 18 per cent. of those occupied in agriculture. In the case of France, 12 per cent. of those in the manufacturing, etc. group referred to would amount to 590,000 on the basis of the 1921 census, or only 12 per cent. of those

employed in the agricultural group. In the case of Germany, 12 per cent. of the unemployed males in extractive, manufacturing and transport work would be about 1,400,000, which is about 30 per cent. of those occupied in agriculture. This is a higher figure than for either the United States or France, but it is still much below the corresponding one for this country. In the light of this it is interesting to note that the position of unemployment in Germany is much more comparable to that here than it is either in France or in the United States, but there are many other factors which may, partially at least, account for this.

The circumstances of agriculture in the other three countries are widely different from those in this country, and it would not seem to be difficult for agriculture in those countries to absorb an appreciable proportion of unemployed from manufactures. As manufacturing developed last century, it drew upon agriculture for the increased labour required. There is no possible chance for the process to be a reversible one in this country, though to some extent it could be, if the need arose, in the others. I suggest that the peculiar distribution of our population as regards occupations also contributes to our difficulties in finding employment for those unemployed in industry at the present time.

It is possible to analyse the problem in more detail by a comparison of the employment figures in the United States and this country, but before doing so it will be of interest to make one or two remarks about the comparison of the figures for females in the four countries mentioned above. The following is a summary of the position of female employment in the four countries :—

Proportion of Women over 10.

Country.	In Domestic Employment.		In Agricultural Employment.		In other Employment.		Not occupied.		Total.	
	Pre-war.	Post-war.	Pre-war.	Post-war.	Pre-war.	Post-war.	Pre-war.	Post-war.	Pre-war.	Post-war.
England and Wales ...	125	92	6	5	194	213	675	690	1,000	1,000
France ...	47	39	195	216	224	216	534	529	1,000	1,000
United States ...	73	54	52	27	109	131	766	788	1,000	1,000
Germany (approx)	60	51	182	188	133	194	625	567	1,000	1,000

If the proportion of women "in other employment" in England and Wales at the last census had been the same as in the United States, instead of having 3,414,000 women so occupied in 1921 we should have had only 2,150,000 so employed. In comparison with

the United States, therefore, employment other than domestic and agricultural absorbs an excess number of women of more than 1,250,000, but the employment of women in non-domestic and agricultural occupations is no more developed in this country than in France, and very little more than in Germany. The only place where women's employment in this country can be said to compete with men's is in "other employment," and the increase which occurred in this since 1911 hardly seems to have been large enough to be an appreciable factor in explaining the relative decline in the employment of men.

To turn now to a more detailed examination of the employment figures in the United States and in England and Wales. Since 1921, under the Unemployment Insurance Act of 1920, we have known the facts regarding unemployment in this country in considerable detail for each individual industry, and it is possible, therefore, to trace the course of employment for individual industries for the past few years. In the case of the United States only partial information regarding employment is available. As against our Unemployment index, based upon about 12,000,000 individuals, the Bureau of Labour Statistics of the United States issues a monthly index of employment based upon returns made by some thousands of establishments in selected manufacturing industries. The returns for August, 1928, for example, cover establishments with 3,112,000 employees. The information obtained from each firm shows the number on the pay-roll each month and the amount of the pay-roll for the month. The published index expresses the number employed in a particular month with the average employed in 1923. Thus the index of 86 for August, 1928, indicates that the 11,097 establishments in the 54 principal manufacturing industries of the United States had only 86 people on the pay-roll in August of 1928 for every 100 on the average in 1923. 1923 was a year of exceptional manufacturing activity in the United States in relation to the two years adjacent to it, and if the index had been based on the average of 1924 instead of 1923, it would have been about 95. Even so, however, I think that these figures must be looked upon with some suspicion as indices of the real position of employment in the United States. It is not unnatural that the firms making returns should be those fully established in 1923, and it is possible, therefore, that new firms are not adequately represented in the sample. It may be, therefore, that employees leaving old-established and joining new firms, or firms in the process of rapid development as well as the new employees going into those firms, do not get properly accounted for, and that the index does not represent the state of employment in a really random sample of the population of the

United States. Though I give this as a criticism of the United States index, I should add that the criticism does not seem to be valid in the case of the only industry in America with which I have any acquaintance, namely, the leather industry. The index given by the United States Bureau of Labour statistics for that industry does seem to be in good accord with other information regarding it. It was, as a matter of fact, the knowledge that the leather industry in the United States was depressed even more than the industry in this country (and to a smaller extent similar knowledge of the textile industries) which prompted the detailed examination of the figures of other industries about to be described.

As further evidence regarding the value of the conclusion drawn from the sample as applicable to the whole population, the following figures of wage-earners obtained from the biennial census of production of manufacturing industries in the United States can be given :—

1914	...	...	...	...	6,888,000
1919	...	...	...	...	8,990,000
1921	...	...	...	...	6,938,000
1923	...	...	...	...	8,768,000
1925	...	...	...	...	8,384,000

These figures relate to establishments with an output exceeding 5,000 dollars in the year of the census, but as in 1921 99·4 per cent. of the total wage-earners in the whole of the manufacturing industries were in such establishments, the figures are practically complete. The sample showed a decrease from 1923 to 1925 in the number employed in manufacturing industries of 8·5 per cent., but the complete census showed a decline of 4·5 per cent., so that the sample did at least show the correct tendency, though exaggerated.

It will be useful to set alongside the above figures of the total employment in certain years in the United States some corresponding figures for this country. Each year the Ministry of Labour collects figures of the total number of insured persons in each occupation and industry, and also has monthly figures of the numbers unemployed in each. These include figures for a number of non-manufacturing industries; and to get figures comparable with those above for the United States, those of the non-manufacturing industries must be excluded. On this basis the annual average of the numbers employed at the end of each quarter in manufacturing industries in this country for recent years is as follows :—

1923 (partly estimated)	...	...	...	...	5,710,000
1925	...	...	...	...	5,940,000
1927	...	...	...	...	6,200,000
1928	...	...	...	...	5,980,000

The indices of employment in Great Britain used for the purpose of comparing individual industries here with those in the United States have been obtained in the following manner. The number of insured persons is estimated by the Ministry of Labour in July each year (N). If the number unemployed in any month is (n), the percentage of maximum employment is $100 \left(1 - \frac{n}{N} \right)$.

This last figure has been expressed as an index on the average for 1923. Only for certain groups of industries is a comparison between the United States and Great Britain possible, these groups being, (1) Food, (2) Textiles, (3) Iron and Steel, (4) Leather, (5) Paper and Printing, (6) Chemicals, (7) Tobacco, and (8) Vehicles. In some cases the individual industries constituting the group are not the same in the two countries, *e.g.* boot manufacturing is included in the "Leather" group in the United States, but is in "Clothing and Apparel" in Great Britain. As the figures for individual industries in Great Britain are available, they can be placed with the appropriate group as constituted for the United States figures. It is sufficient to make a comparison for certain dates each year, and indices for the months of March, June, September and December have been worked out. These are shown in Table B.

The eight individual groups of industries referred to in the table cover about 4,000,000 employees in Great Britain out of a total of 12,000,000 insured persons. This is not a large proportion, but it is all for which comparison is possible with the American figures. If we were to form our impression of the relative state of industry in the two countries solely from the figures given in Table B, we should certainly conclude that Great Britain was not less prosperous (from the point of view of employment) than the United States. 1923, however, was a bad year to use as a base for employment statistics, particularly for the United States (for reasons given above), and it is rather surprising that the Bureau of Labour Statistics have maintained that year as a base. It does not seem to be the base year for any other commercial or industrial statistics in that country. 1924 would certainly be a better base year for the United States, and it would be a suitable year also for this country for at least three reasons, namely, (1) it was three years removed from the great slump, (2) it was the year of the census of production, and (3) it was free from any big labour dispute. For the purpose of a simple picture, comparing the experience of Great Britain with that of the United States, therefore, the following summary has been made :—

Comparison of Employment Indices in Certain Groups of Industries in Great Britain and the United States.

	1924.		1925.		1926.		1927.		1928.*	
	G.B.	U.S.	G.B.	U.S.	G.B.	U.S.	G.B.	U.S.	G.B.	U.S.
All industries ...	100	100	88.6	101.6	97.3	102.1	100.8	98.1	99.1	95.8
Food Group ...	100	100	100.7	94.9	101.0	93.5	102.2	93.9	102.0	81.9
Textiles Group ...	100	100	98.3	101.1	93.0	88.1	102.9	98.0	99.0	93.8
Iron and Steel Group ...	100	100	101.1	102.2	98.0	107.0	105.0	99.1	101.3	98.0
Leather Group ...	100	100	99.8	101.1	98.4	99.0	102.6	97.1	98.7	98.6
Paper and Printing Group ...	100	100	100.8	100.7	100.4	103.4	101.1	103.4	101.8	101.3
Chemical Group ...	100	100	100.2	104.4	98.5	108.4	101.9	104.0	108.7	101.9
Tobacco Group ...	100	100	101.5	98.0	103.6	91.1	103.9	89.9	103.8	87.4
Vehicles Group ...	100	100	101.1	104.0	97.4	103.2	101.1	94.2	99.9	101.1

* Based on the indices of the first three quarters only.

We are restricted in our field of comparison by reason of the labour troubles in this country in 1926. The index for "all industries" for the United States moved up in 1925 and in 1926 in a manner in rough accordance with general reports of industry in that country. In 1927 and 1928, however, it moved in the other direction, and for each year was lower than the index for this country. Only in the case of two groups, paper and chemicals, did the index for the United States for 1927 stand at a higher level than those of Great Britain, and in the other six the Great Britain index was appreciably higher than the United States one. The difference in favour of Great Britain becomes more marked in 1928, though it is possible that if the complete data for that year were available, the difference would be smaller. Recognizing the fact that the two sets of indices are compiled by different methods and that the field covered is only about one-third of all manufacturing industries, it is nevertheless significant that when we examine the data available for comparison of individual industrial groups, employment in manufacturing industries in this country seems to have developed in recent years at least as much as in the United States. It may be that there is substantially more unemployment in the United States than is generally recognized, and the lack of any general statistics of unemployment in that country hides the fact. Reports in the first half of 1928 indicated that this is probably the fact, and some personal experience also points in the same direction. It seems probable, however, that the fact that the manufacturing and allied industries only represent 45 per cent. of the total employment in that country enables the employees displaced to be more readily absorbed in other work than is possible over here.

The figures given above of the total numbers employed in certain recent years in manufacturing industries in the United States and

Great Britain seem to indicate that our manufacturing industries are continuing to maintain people in employment to a greater extent than are those of the United States. At first sight it seems paradoxical that the latter country, with a population increasing by 1,500,000 persons per year, should show declining numbers employed in manufacturing, while over here, with a population increasing very slowly, the numbers in manufacturing industries, up to the end of 1927 at any rate, were increasing. Agriculture and the non-manufacturing industries must be absorbing labour rapidly in the United States, and this, as pointed out above, is more readily done since these other occupations account for 55 per cent. of the labour employed.

In the United States there is compiled an index of "factory pay-roll" corresponding to the index of manufacturing employment as well as an index of production in the manufactures. Since 1919 the annual averages of the monthly indices have been as follows:—

Date.				Employment.	Pay-roll.	Production.
1919	...	...	...	100	100	100
1920	...	...	...	103	124	104
1921	...	...	...	82	84	80
1922	...	...	...	90	89	104
1923	...	...	...	104	113	120
1924	...	...	...	95	104	117
1925	...	...	...	95	107	125
1926	...	...	...	96	109	129
1927	...	...	...	92	105	126
1928	...	...	...	89	103	132

The net movement from 1919 to 1921 was similar for the three indices, but by 1928 employment was 11 per cent. below that of 1919, while the wage-roll was 3 per cent. more and actual production was no less than 32 per cent. more. This seems fairly definite evidence of the extent of the development of labour-saving devices in the United States. Similar comparison is not possible for this country (though the monthly *Gazette* of the Ministry of Labour provides certain information regarding the pay-roll and employment for a few individual industries), but it is certain that our manufacturing production has not shown anything like the development indicated by the United States index: though labour-saving machinery has developed in this country, it has not developed to anything like the same extent as in the United States; and though this fact has up to the present helped to maintain more people in employment, it is likely to have caused an increase in our costs of production,

and this fact again reacts on our power to compete in neutral markets.*

All the comparisons made between this country and the United States (and to a smaller extent with France and Germany) seem to support the view that our unemployment problem is aggravated by the fact that there is such small scope for manual labour outside the manufacturing occupations and those allied to them. We may have had great advantages from the fact that it has been our policy to stimulate manufacturing industry in this country at the expense of agriculture, but it would seem that we have now reached a stage in our development where we have to face possible disadvantages of the policy.

In summarizing the conclusions reached in this paper I would emphasize that it only claims to deal with one aspect of the problem of employment. Whether or not, for example, the facts regarding employment could be substantially modified by any change of monetary policy is another aspect of the problem which may, or may not, be of greater importance, but it does not arise in our description of that side of the problem which I have dealt with.

This description does, I think, go a little way towards helping us understand why we have apparently reached a stage in which 10 per cent. or more of unemployment seems perennial. From this point of view the conclusion may seem a pessimistic one. But the enquiry has in some small degree revealed new truth it cannot properly be described as pessimistic, since only by a thorough understanding of the facts can we be satisfied that the remedies we may undertake are on right lines. The case of France shows that it is possible for a country to be industrially prosperous even with a stationary population, and there is no fundamental reason why we should not find an equally satisfactory solution in this country.

The inference from the facts described in this paper seems to be that we should cease to depend mainly on traditional lines for recovery of industrial prosperity. The fact that we developed great prosperity in the sixty years after the middle of last century by building factories, ships, railways, etc. must not mislead us into thinking that this is necessarily the only way of reviving our prosperity again. Factories have been built and extended since the war under the mistaken impression that there was going to be such a demand for the products of these factories that they would be kept

* An index of production for this country comparing 1913 with recent years is published quarterly by the London and Cambridge Economic Service. This index, however, is based upon a sample, and that not a random sample, of 25 per cent. of employees in industry alone. The Board of Trade Index of Production so far only covers 1924, 1927 and 1928.

going at full capacity. In many cases it is now found that the assumption was wrong, and that the money spent, although it gave a certain amount of temporary employment, was not economically well directed.

There are, I think, conclusions of practical force to be drawn from the facts set out in this paper both by those who have to face the problem as a whole and by those who are mainly concerned in its application to a particular industry. To the former, the fact that we have a bigger proportion of our male population associated with manufacturing and allied industries than any other country of comparable size, and a far smaller proportion in agriculture, is of special importance. This means that there is very little alternative possible for manual workers when deprived of manufacturing employment. On the whole, the figures suggest that we have not done so badly in this country in absorbing labour in existing industries, and that the reason other countries apparently show up better is that there is much greater opportunity for absorbing the overflow of labour from manufacturing industry in other types of employment.

As apparent success, however, may ultimately be found to be bought because it may tend to increase costs of production is country. Our policy has had to be to ask employers to employ as many men as possible in order to reduce the number unemployed, and many employers have done this when their purely individual interest might have led them to devise means of reducing employment rather than to extend it.

Those persons who are chiefly concerned with the prosperity of a particular industry should, I think, find the facts set out in this paper of value. If he makes consumers' goods it is of great importance to him to have some idea of his future market, and estimates of future population are essential to the intelligent understanding of his problem. An industry producing mainly for adults is in a different position in this respect from one catering for younger people. This point can be readily illustrated by some figures used by the Board of Trade in the construction of the Index of Production. Taking the average production of 1924 as 100, the average indices of production for the eighteen months from the beginning of 1927 (embracing a period of great activity) for various classes of boots were as follows :—

Women ...	...	...	...	...	119.4
Men ...	...	...	...	...	115.4
Girls and Maids	...	...	...	...	112.7
Youths and Boys	...	...	...	...	105.0
Infants ...	...	...	...	...	74.7
All ...	...	...	...	...	111.5

The application of the facts set out in this paper to an industry making capital goods is not quite so direct. If his goods have been required for developing some area abroad which has produced food to be imported into this country, a manufacturer is certainly very directly concerned with the slowing down in the rate of growth of our population. But in many cases the connection may be much more remote, or there may be no association apparent at all between his individual prosperity and population growth. There can be nobody associated with industry, however, who will not fail to know his market better through a full knowledge of the facts relating to growth of population.

It will not be inappropriate in closing to refer to the fact that in connection with the Local Government Bill, now almost the law of the land, quinquennial censuses of the population will be taken. This Society has advocated quinquennial censuses for a long time past, and I am inclined to think that the statistical historian of the future will express the opinion that it was unfortunate that the decision was not taken in time to have had a census in 1926. While our population was growing almost in linear progression from one census to the next, the omission of an enumeration at a mid-point was inconvenient, but did not have any serious consequences. I am inclined to the view, however, that had the facts of the population been determined in 1926 we should have found a change which would have startled many people, and would have directed attention to the problems referred to in this paper in a far more emphatic manner than is possible on the basis of estimates, however accurate they may turn out to be.

TABLE A.
England and Wales

Estimates of Population in Quinquennial Age Groups, 1926, 1931, 1936 and 1941.

Age Group	Males (000's omitted)					Females (000's omitted)				
	1921	1926	1931	1936	1941	1921	1926	1931	1936	1941
0-5	1,681	1,728	(1,700)	(1,700)	(1,700)	1,640	1,681	(1,660)	(1,660)	(1,660)
5-10	1,767	1,616	1,606	(1,630)	(1,630)	1,752	1,651	1,620	(1,600)	(1,600)
10-15	1,847	1,740	1,690	1,680	(1,600)	1,833	1,728	1,536	1,537	(1,580)
15-20	1,726	1,804	1,701	1,661	1,600	1,770	1,710	1,702	1,535	1,573
20-25	1,446	1,683	1,757	1,663	1,600	1,703	1,737	1,737	1,666	1,503
25-30	1,340	1,400	1,633	1,704	1,615	1,600	1,570	1,555	1,705	1,613
30-35	1,281	1,304	1,367	1,563	1,636	1,520	1,571	1,610	1,441	1,660
35-40	1,274	1,244	1,266	1,277	1,311	1,473	1,477	1,531	1,565	1,595
40-45	1,222	1,227	1,178	1,111	1,176	1,506	1,436	1,431	1,484	1,516
45-50	1,163	1,166	1,173	1,145	1,160	1,444	1,425	1,375	1,373	1,431
50-55	970	1,096	1,100	1,105	1,079	1,043	1,166	1,261	1,310	1,314
55-60	780	894	1,011	1,014	1,019	843	977	1,110	1,183	1,226
60-65	603	669	769	833	890	651	777	898	1,003	1,077
65-70	446	493	564	640	720	506	566	665	851	869
70-75	293	334	365	421	481	317	420	465	577	675
75-80	167	173	204	234	267	233	200	267	311	356
80+	93	100	116	134	150	164	165	200	229	263

See text for explanation of figures in brackets.

TABLE B.—*Comparison of Employment Indices in Great Britain and U S A.*

Average of 1923 = 100

GROUPS OF INDUSTRIES

Date.	Food Group		Textile Group		Iron and Steel Group		Leather Group		Paper and Printing Group		Chemicals		Tobacco		Velocity		All Industries	
	G B	U S A	G B	U S A	G B	U S A	G B	U S A	G B	U S A	G B	U S A	G B	U S A	G B	U S A	G B	U S A
1924																		
March	99.1	96.7	108.4	96.0	104.8	94.6	100.2	97.0	99.5	101.2	101.9	102.2	91.9	91.4	102.5	90.7	101.6	91.4
June	100.5	94.2	103.7	94.7	104.7	82.1	101.9	83.0	100.6	99.4	101.7	81.6	98.6	92.2	101.0	90.7	102.1	87.9
Sept.	100.5	97.1	103.7	93.7	102.7	78.9	101.2	80.6	100.5	99.4	101.9	81.0	99.7	91.1	99.5	94.2	100.7	86.7
Dec.	98.9	96.6	106.4	88.4	103.1	84.0	99.1	90.8	100.0	101.7	102.1	90.2	100.4	96.7	102.1	91.4	100.6	91.4
Average	99.8	95.9	101.1	88.2	103.7	86.0	100.6	90.3	100.5	100.5	101.9	91.3	98.9	91.7	102.1	87.7	101.2	90.1
1925																		
March	99.2	90.1	101.2	92.4	104.7	88.8	100.6	90.4	99.7	101.4	102.0	99.0	97.6	97.6	103.2	90.9	100.1	90.2
June	100.8	89.3	98.2	87.8	101.8	86.6	99.6	89.9	101.0	99.4	101.9	87.1	100.3	90.6	101.2	90.1	99.2	90.1
Sept.	101.1	93.3	101.7	86.9	101.3	81.2	97.7	94.8	101.0	100.2	101.8	97.0	107.3	92.0	102.3	12.1	99.1	90.9
Dec.	101.1	92.0	105.1	89.6	103.8	89.9	101.8	91.2	102.1	103.6	102.7	95.0	107.7	90.0	106.0	91.7	100.9	92.6
Average	100.5	91.0	102.3	89.2	101.9	87.9	99.9	91.3	101.1	101.1	101.1	93.3	100.7	92.8	105.2	91.2	99.8	91.3
1926																		
March	101.0	89.3	104.0	90.0	100.8	93.0	102.2	91.4	101.6	103.1	102.3	103.2	101.7	88.2	104.1	96.1	101.6	93.7
June	101.3	88.7	104.0	89.1	101.8	92.6	99.7	91.3	99.7	102.0	95.6	93.7	102.0	86.7	96.0	92.1	96.2	91.3
Sept.	100.0	92.4	102.7	84.2	90.9	92.6	97.0	93.9	100.0	101.0	99.2	100.3	102.5	90.1	91.3	91.0	97.2	92.3
Dec.	100.3	87.7	101.6	87.7	96.9	89.6	100.1	90.2	101.2	106.1	101.4	91.0	103.4	85.3	99.5	82.9	99.9	90.9
Average	100.5	89.0	101.6	86.5	96.4	92.0	99.0	90.3	100.7	103.0	100.1	99.0	103.5	86.0	99.5	90.5	98.5	92.0
1927																		
March	101.0	87.2	107.2	89.7	108.4	90.3	102.0	91.6	100.5	104.4	103.3	103.0	109.9	91.1	103.3	89.3	101.0	91.4
June	102.3	90.7	107.3	86.0	109.5	86.0	103.7	83.2	101.6	103.4	103.4	90.3	102.1	84.0	104.5	89.1	102.7	89.1
Sept.	102.5	92.1	106.7	86.9	108.9	84.0	103.0	91.3	102.0	103.4	104.0	93.8	102.9	87.5	101.4	87.7	102.1	88.0
Dec.	103.4	89.0	107.0	86.5	108.3	79.7	104.3	82.9	102.2	103.4	104.5	90.4	103.8	84.6	103.3	77.1	101.6	89.1
Average	102.0	90.0	107.1	87.3	108.6	85.2	103.2	87.7	101.7	103.9	103.6	91.9	103.5	86.1	103.2	85.6	102.0	88.4
1928																		
March	101.4	87.4	107.2	88.4	109.0	82.8	104.2	87.1	101.9	102.4	104.8	100.1	101.9	82.2	103.7	85.0	101.8	80.1
June	102.0	87.0	102.7	81.0	108.3	84.1	98.5	86.9	103.6	102.5	104.4	96.1	102.9	81.6	101.9	81.1	100.1	85.4
Sept.	102.0	89.8	99.4	80.6	107.4	85.7	98.2	80.9	101.9	102.1	104.0	93.2	101.4	61.7	100.3	92.6	98.7	87.3
Dec.	101.1	—	109.0	—	106.7	—	97.0	—	101.0	—	101.2	—	101.8	—	101.7	—	100.0	—
Average	101.6	88.1	103.1	82.7	108.1	81.3	98.7	84.0	102.2	102.0	104.5	93.1	103.0	81.8	102.1	88.9	100.5	80.0

DISCUSSION ON DR. SNOW'S PAPER.

DR. BONAR: We have always demanded here in a loud voice that there should be at least a quinquennial Census, but I noticed recently in the Preliminary Report of 1881 that the proposal made in 1753 was for an *annual* Census. I do not know whether the Statistical Society is prepared to go as far as that or not. This remark is entirely irrelevant to the body of Dr. Snow's paper, but he has brought it on himself by his last paragraph.

I rise to propose in a most cordial manner a vote of thanks to Dr. Snow for the whole paper, none the less because it is, in some respects, of so controversial a nature that we shall all have different reasons for being thankful. My own reasons may be quite different from those of other people.

I would thank Dr. Snow for not laying emphasis on his title—"The Limits of Industrial Employment"—because what he has really touched on are not absolute *limits* (few would allow that there are any), but *obstructions* in the way, and that was brought out by him as he went along. That allows us to hold a theory to which I am always inclined, that the present troubles come largely from a slowness of accommodation to a changed "mentality" in the working classes. The people have changed, and we have not recognized it and are providing for them as if they were the same.

The second reason I have for thankfulness is that Dr. Snow laid such emphasis on consumers as distinguished from producers. When I read the paper first, it made me think of what John Henry Newman said in a letter describing an interview with a celebrated ecclesiastic, speaking to him of the laity: "After all," he said, "who are the laity?" and Dr. Newman replied, "The Church would look foolish without them." I think it is the same with regard to producers and consumers. If the producers do not take care that what they are providing is what the consumers require, they will fail. You may say that the consumers are mainly fools, but all the same you have to provide for them.

My third reason for thankfulness is in respect of that most attractive account of consumption according to age, and of how it is affected by the decline in the birth-rate. So far as I know, that has not been done here before, and to my mind it is very instructive, whether we agree with all that followed or not.

Dr. Snow practically tells us that the present difficulty is mainly caused by this slackening birth-rate; but was there no prior cause? What was happening at the very time the slackening began—about 1894? About that time the working classes were attaining a power which they did not at that time fully possess, their present power, enabling them to remove the old elasticity which followed any movement in an industry as regards the demand for human services, and to substitute something like rigidity, in order to preserve their standard of living. Although I sympathize with what is at the back of this policy, it has caused a great deal of suffering which can only be removed by patience and mutual accommodation. That remark

about the change in the mind of the working classes was suggested to me by the early book of Taussig on *Wages and Capital*, 1896. It conveyed the idea that the workers cannot have really high wages until there is a market that supplies the goods that the high wages will be spent upon; the wages are not effectively high until that has been done; the goods must be such as fit the new dominant class. The time does not seem to have arrived yet; some would say that the cinema is all that has been so provided. The producer must cater more expressly for the working classes, who have the power in their hands, as we are likely to find out in this present year of 1929.

Dr. Snow gives a very interesting account of the United States and of France. At first he had seemed to see us descending into a Valley of Humiliation; but this comparison opens a brighter prospect. The United States are not indeed stationary, but are willingly becoming so, and they are reducing immigration. There is a prosperous country, and yet it is tending towards the very state we are told to avoid. France has been in that stationary state for a hundred years, and we are told that France is the only prosperous country in Europe just now. Yet, in it, immigration is absolutely indispensable. Which of the two countries are we going to resemble? Both are prosperous.

The paper ought to produce a brisk discussion, and I call upon you all to support me in heartily thanking Dr. Snow for it.

MR. A. R. BURNETT-HURST: I have very great pleasure in seconding the vote of thanks to Dr. Snow for his interesting paper. I am sure all will agree that some most controversial issues are raised, and that Dr. Snow is to be congratulated on his ingenuity in dealing with them. He has not so much indicated the limits of industrial employment as enunciated a new doctrine of population—somewhat on the Malthusian lines. Malthus maintained that the population was outstripping the means of subsistence, and that unless the growth in numbers was hindered by positive or preventive checks, population would be reduced by misery and starvation. Dr. Snow, on the other hand, concludes that industrial output is increasing more rapidly than the growth of population, and unless this over-production is prevented by employers, a stage will be reached when production will be checked by unemployment. I do not know whether I have formed the correct conclusion, but this appears to me to be the main argument underlying the whole paper.

I do not wish to say anything which will detract from the general merits of the paper, for there are many points on which I cordially endorse Dr. Snow's views, but there are also a few points upon which I should like to comment. First of all, Dr. Snow states, on p. 325: "In this country, for example, we have had to manufacture ships, bridges, railways, etc. for the purpose of developing countries overseas in order that they may provide the food and raw materials necessary for our physical welfare." He appears to suggest that our capital exports have been for the purposes of economic exploitation. I may be wrong in my interpretation; I hope I am. The bulk of our

capital exports were for the purpose of economic development; for example, railway construction and equipment in other countries. Such development would stimulate the purchasing power of the people of those countries and would eventually result in an increased demand for British goods. We have invested a large amount of capital in India, not for the purposes of economic exploitation, as certain Indian politicians would have us believe, but for the development of industry and commerce. The export of capital to that country was not only to enable us to obtain tea, wheat, rice and raw materials, but also to enable India to develop her coal-mines, and her jute and cotton mills, for the benefit of the people of the country. The development of the Bombay cotton mills which now provide yarn and piece goods for local consumption has adversely affected the position of Lancashire in the Indian market, and contributed to unemployment among British textile operatives.

I feel that Dr. Snow has not emphasized the fact that our exports of capital are bound eventually to result in a greater demand for goods from this country because of the economic development of the areas in which the capital has been invested. This applies not only to India, but also to Spain, China, Japan, the Argentine, and other countries. Mr. C. K. Hobson also draws attention to this in his *Export of Capital*. He says: "There is a further and more important reason why foreign investment should increase the demand for capital and labour in this country. Development abroad means that other countries become wealthier, that their demand for goods which Great Britain can easily produce expands, and that they can purchase British produce and manufactures by sending raw materials and other commodities in immediate exchange."

Dr. Snow takes the view that with the decline of population we shall consume less raw material, and in consequence the exports which we exchange for imports of raw material will decrease; but why not emphasize the other side? If these countries as a result of their economic development demand more goods from us, we shall then be in a better position to import raw materials and food-stuffs.

On p. 331 there is a striking sentence:—"Owing to that slackening we do not need new factories or new machinery or equipment at the same rate as before. . . ." It seems to me that that is a very astounding statement. The contrary view is expressed in the recent reports of the Balfour and Melchett Committees. After all, the key-note for future development is surely rationalization, which means reorganization, better equipment, more up-to-date buildings, new factories, and new machinery. Rationalization should lead to decreased cost of production, to lower prices, and ultimately to increased demand from both the home and foreign markets.

On p. 343 Dr. Snow deals with the employment of women in industry. He states that "the figures do not indicate that increase of employment of women in manufacturing work has had any serious effect upon the problem of the unemployment of men."

I have been making a close study of this subject, and have arrived at the same conclusion. The Report of the Census of Pro-

duction takes the same view. But did not the position change after 1921? In the period 1911-21, women entered industrial and commercial spheres to replace men temporarily. Has not an entirely different situation arisen since then? After 1921, industry and commerce were faced with the problem of reducing the costs of production. One method adopted by many employers was to instal more machinery and to employ more women and girls, because, with the increased use of machinery, machine-minders were required rather than better-paid male operatives. We find that it is really through a movement for reducing costs of production that women have entered the industrial and commercial field in larger numbers since 1921. After analysing the Ministry of Labour's return of the number of persons employed in manufacturing industries, including the building trade, I came to this startling conclusion :

Comparing 1927 with 1923, I found that there had been a decline of fifty thousand in the number of male insured persons employed in manufacturing industries and an increase of seventy thousand women in the same industries. I could not carry the comparison any further because under the Widows', Orphans' and Old Age Pensions Contributory Act of 1927, all persons aged 65 years or over ceased to be insured from January, 1928. A decrease of fifty thousand men, when there are about four hundred thousand unemployed males in these manufacturing industries, is certainly an appreciable decline.

There is one question I should like to ask Dr. Snow. He admits that he has dealt with only one aspect of the problem—the effect of the slackening in the growth of population on unemployment. I think we are entitled to ask him if he can say approximately what proportion of unemployment is due to this slackening.

I have very great pleasure in seconding the vote of thanks to Dr. Snow.

MR. HILTON said that he disagreed with Dr. Snow's paper more completely than with any statistical production of his generation that he remembered. He appreciated the manner in which Dr. Snow set about the paper and he thought there was a good deal of value in the way in which he had set out the slackening of the rate of growth of our population. He appreciated the ability with which the estimates of the size and age-composition of the population in future years had been compiled. But he disagreed completely with the deductions drawn from the facts.

The argument was that unemployment was, at least in part, a consequence of the "slackening of the rate of growth of our population" (p. 324). There was "a tendency to excessive production in industry" (p. 336). In the past, constant additions to the population had constituted an additional market for the additional wares. Now the increase in population was falling off, and as a consequence "we have apparently reached a stage in which 10 per cent. or more of unemployment seems perennial" (p. 354). That was the argument and the conclusion.

Mr. Hilton's rejection of the argument rested on two grounds. The first was that Dr. Snow thought the measure of a market was the people in it. Any market proprietor, whether of a village bazaar or an international fair, would tell him he was wrong. The size of a "market" was not a matter of counting heads but of gauging pockets.

According to Dr. Snow's argument 10 per cent. more people meant a 10 per cent. bigger market. That might be; but only provided the purchasing power remained the same. According to the argument, a stationary number of people was a stationary market. It might be; but only provided the purchasing power remained unaltered. Mr. Hilton did not deny that more people, other things being equal, meant a bigger market. But he asserted that average purchasing power might increase or decline independently of aggregate numbers, and that it did, in fact, fluctuate to an extent far exceeding in effect the changing rate of growth of the population. It might and did fluctuate to so much greater an extent that aggregate purchasing power might increase while a population was stationary or declining; it might decline while a population was numerically increasing. And the only thing that mattered from the market standpoint was aggregate purchasing power. For this purpose, to count heads without gauging pockets was to indulge in an irrelevant proceeding.

The source of the error into which Dr. Snow had fallen could be traced to two little words that appeared on p. 331. His category A of occupied people read: "Those producing goods for early consumption." After that phrase there followed the words: "*e.g.* food, boots, etc." The fatal words were "food and boots." Dr. Snow was thinking of "goods for early consumption" as typified by "food and boots," and as the individual capacity to absorb food and boots was limited, he had, it would seem, passed to the conclusion that the individual capacity to absorb other things was similarly limited.

One might agree that a rising standard of living did not mean an increased stomach capacity. One might agree that if the standard of living (the real income of the population) were doubled, not much more food per head would be consumed. It would be better food, more varied food, more appetizing food, more costly food, and its production and preparation would require more labour and cause more employment; but he agreed that the consumption of food was related to the numbers to be fed more than to the purchasing power of those numbers.

One might agree also that boots were a little akin to food in this respect. Double the standard of living and you would not double the consumption of boots. Many people abhorred new boots: they clung to the old comfortable ones until leakage or very shame made them cast them off. He was speaking of the male part of the population; the female part had other ways. Moreover, as the standard of living rose, people bought a bicycle, used the 'bus and even acquired a car; and as a result needed fewer boots, not more. So far as boots were articles of utility and not of ornament he would expect the "law" to be: the higher the income the fewer the boots.

Food and boots, then, so far from being typical goods for early consumption, were in a class apart, non-typical or even anti-typical. The market for *them* might be a function of the numerical size of the population. The market for other goods, and the market for consumable goods as a whole, was a function not of the numerical size of the population but of its effective purchasing power.

When people had satisfied their requirements in food and boots they wanted improved dwellings, more frequent painting, paperhanging, distempering, furniture, tablecloths and table-ware, pots and pans and knives and forks, clothes, push-bikes and motor-cycles, pianos, gramophones and receiving sets, newspapers, books, education, medical treatment, moving pictures, theatres, charabanc excursions, holidays. The capacity for absorbing these had no immediate practical limits. It had nothing in common with food and boots. The capacity for effectively demanding such things was not a matter of the size of the population, but its purchasing power, its standard of living.

The rate of growth of the population might slacken, it might stop, it might reverse; but so long as the standard of living rose, the market for consumable goods, and the market for capital goods used in producing consumable goods, would continue to expand.

That was the first point. The second was no less distinctive. It must be remembered that the argument was in regard to unemployment. The slackening of the rate of growth of the population would help us to understand. Dr. Snow said: "Why, we have apparently reached a stage at which 10 per cent. of unemployment seems perennial." There was a lesser increase in buyers, therefore the necessary increase in demand was not felt, and many were out of work. When it dawned on Mr. Hilton, at his first reading of the paper, that this was the argument, he had the sensation of one whose familiar problem suddenly took a hand-spring and stood on its head.

The hours he had spent patiently examining assertions that unemployment was due to an excess of population! The stoppage of emigration during the war, he was told, made up for all the war casualties, and the reduced emigration since the war had resulted in a glut of persons almost exactly equal to the numbers who could not find work. Was it not clear that every man who could be induced to emigrate meant one man the less on the dole? Was it not clear that every alien admitted to our shores meant a job the less for a British workman? The obvious remedy for unemployment was to get rid of the surplus population and to prevent any insidious additions to it from without! He had naturally felt constrained to point out from time to time that there was a catch in all this: that when a potential job-taker was lost, a consumer was lost, and when the entry of a potential job-taker was suffered, a consumer was gained; but the practical man had had little patience with such doctrinaire theorizing. It was obvious that there were more people than could be employed. The remedy was to reduce their number. . . . He had of late comforted the holders of these convictions with

the news that from 1931 onwards there would be fewer applicants for work.

And now, as he said, Dr. Snow had stood the whole thing on its head. In the twinkling of an eye the bogey had become the blessing and the cure had become the disease. What Great Britain was suffering from was not an excess of population but a diminished growth. If Dr. Snow were right, Overseas Settlement procedure had better be reversed and subsidies offered, not to those who wished to emigrate but to those who would pledge themselves not to emigrate. Or, still better, emigration might be forbidden and the Overseas Settlement funds used as bonuses to be paid to alien emigrants who, by settling here, would increase the "size of our home market."

In point of fact, one need only whisper in reply to Dr. Snow's fallacy what had been whispered in reply to the same fallacy while it was still right side up: that every added consumer was an added producer, and every subtracted consumer was a subtracted producer. The population-reducers forgot one side of that equation; Dr. Snow had forgotten the other.

He was aware, of course, of the passages in the paper in which Dr. Snow explained that he was dealing only "with certain factors affecting employment, without enquiring whether there were other factors which alleviated those effects." If that should be quoted in justification of the argument, he replied in advance that to count heads instead of gauging pockets was an unprofitable proceeding, and that to consider the additional man as a commodity-demander without remembering that he was also a job-demander was to wander through confusion to futility.

In so far as it was a service to turn a fallacy upside-down, Dr. Snow's paper had rendered that service. From that point of view it might do good. In so far as a changing age-distribution was likely to affect the distribution of expenditure and so to affect the relative activity of industries, Dr. Snow's tables would give useful guidance. But that anyone should be led into supposing that the cause or cure of unemployment lay in the direction indicated by Dr. Snow would be a public misfortune.

MR. GLENDAY said that he would like to congratulate Dr. Snow on his courage in not confining his paper to pure statistical analysis, but venturing to speculate on the course of current events. From the business point of view such speculations were of great value, for if it were true, as many believed, that industry was passing through a period of transition, it followed that most of the accepted methods of measuring industrial change were unreliable as guides to policy. He himself had approached the paper from much the same critical angle as Mr. Hilton, and was in agreement with his earlier remarks; but as Mr. Hilton had further developed his argument he had felt himself drawn more into sympathy with Dr. Snow.

It was perfectly true that the purchasing power of a community could not be measured solely by a count of heads, but it was equally true that changes in the numbers and distribution of the population

to which Dr. Snow had drawn attention, provided material which should be of great value in measuring the potentialities of the market for certain types of goods. To appreciate the position it was necessary to take the matter a stage further than Mr. Hilton had done, and subdivide purchasing power in accordance with the ordinary categories of expenditure, viz. necessities, semi-luxuries, luxury and investment.

While it was true that in a sense such subdivision might be considered as outside Dr. Snow's paper, since it involved the monetary aspect of the problem, at the same time, without it he did not think it was possible either to apprehend the true import of Dr. Snow's analysis or the limits of Mr. Hilton's criticism of it.

Mr. Glenday was of opinion that population figures provided valuable information for making estimates of the *home* market demand for certain necessities and semi-luxury goods, but were less useful when it came to dealing with the more fluctuating items of expenditure such as luxuries and investment. But this was not all. There might be said to be two alternative lines of industrial development which an industrial community could pursue, once the primary needs of its members had been satisfied. It might either devote its energies to increasing the standard of living of its own members and in improving their surroundings and equipment, or it might occupy itself in extending its *existing* level of civilization and standard of living to the less civilized countries and undeveloped areas of the world.

While both types of development had been pursued by the principal industrial countries of the world in the past at one and the same time, the tendency had been to concentrate on one or other alternative.

Before the war, when the "live" side of our trade tended to be in the export category, we might be said to have concentrated on the latter alternative, viz. extending our own standard of living and level of industrial development to undeveloped countries overseas; in the recent post-war years it had been largely replaced by the former type: development in all countries having recently been in the direction of raising the level of consumption of *existing* consumers, and the already occupied sections of the population. It would be outside the scope of the present paper to discuss why there had been this change-over in emphasis, but Mr. Glenday had no doubt that it lay at the root of our post-war difficulties, having regard to the fact that we were the pioneers in the pre-war type of development by overseas industrial colonization.

Estimates of the purchasing power available for buying British goods in the future and the correctness of Dr. Snow's diagnosis would depend largely on whether the recent type of industrial development was likely to continue, or whether there would be a reversion to something more like the pre-war balance between home and foreign trade.

If the recent revival in our shipbuilding, our export trade and our foreign investment might be taken as an indication that such reversion was in progress, then our problem in the years to come was much more likely to be that of finding labour to operate our reviving export trades

rather than overcoming difficulties due to curtailment of the *home* market by a falling off in population.

SIR ALFRED WATSON said he did not propose to deal with the economics of the paper. He agreed very largely with Mr. Hilton, but at the same time he thought Mr. Hilton had not done justice to Dr. Snow in his exposition of the relative position of the producer and the consumer, because Dr. Snow was at considerable pains to indicate that while the mere number of consumers might remain steady over a series of years, yet their effective demand was materially altered by the change in their age distribution. That was a new and attractive element of investigation, and they should be grateful to Dr. Snow for having put them on this line of enquiry. He was sorry, however, that he could not accept as typical the ratio of consuming power at various periods of life given on p. 333. The author very carefully said that these were given for illustrative purposes only, but he thought that if Dr. Snow's main thesis was to be established, these figures must be taken to be much more than approximately representative. In order to establish the dismal and depressing conclusion at which Dr. Snow arrived—one which he (the speaker) would be very reluctant to accept—these somewhat remarkable figures of relative consuming power must be regarded as basically true.

If the consuming power of the individual at age 30-45 were represented as .95, it was doubtful if at age 60-75 it would have fallen away to .32. He did not believe that these particular functions ought to be expressed mathematically. He did not believe they began at 0, rose to a point and fell away to 0; he believed that to be a misconception of the position. He would suggest to Mr. Hilton that if he could, through the excellent staff which worked out the cost of living figures, work on a series of budgets of families of varying age composition, he might be able to give us something authoritative as to the relative consuming power at various periods of life. He would probably obtain results considerably different from these figures of Dr. Snow.

There was one other point worthy of more stress. Dr. Snow admitted that some might complain that the indices given for old people were too low, remembering the effect of old age pensions. In 1928 six hundred thousand people over the age of sixty-five began to receive old age pensions at the rate of ten shillings a week, in addition to those who were previously getting pensions, without any condition as to retirement from their occupations. The effect of a sudden increase of consuming power in the case of this class of people might be considerable, and one would expect it to be raised in its relative aspect to a considerably higher figure than that used by Dr. Snow.

Dr. Snow had given a very interesting exposition on how to project the population forward from one decennial period to another. The method he had adopted was an accepted one; it was employed by Messrs. Hardy and Wyatt for the first National Health Insurance investigations and it had been employed since. In projecting the population to future years for the estimates relative to the Con-

tributory Pensions Act of 1925, he (the speaker) was in a difficulty, because he had nothing later than 1921, and he could not compare the male population of 1921 with that of 1911 because of the devastation of the war. In the circumstances he adopted the life table plan, making allowance for the death-rates then prevalent at each age, with an estimated allowance for emigration. The decrement in the population from one decennial point to another must be due to deaths and to the net effect of migration. At the present moment the death-rate was changing very much; it was becoming definitely lower, especially in the earlier and middle periods of life, and that was a factor that should be kept in view by every student of statistics who was proposing to adopt the method used by Dr. Snow. He was not suggesting that Dr. Snow's result was not a good one, because no one knew what was the effect of the migration factor, and if this was not known, it did not matter if they were slightly out with regard to the death-rates that were used. He merely brought this point forward in order to suggest that any investigator who in future was proposing to project the population forward should not automatically employ the method used by Dr. Snow for the purpose of the present paper, but should investigate the death-rates prevalent at the time he did his work, and attempt to form some impression as to the changes in the rates of emigration and immigration which were likely to come about, as compared with the previous ten or twenty years. This might be a very important factor.

PROFESSOR GREENWOOD said that Dr. Snow's forecasts interested him. Some five years ago he had tried to forecast the future population, taking into account the changes of the death-rate (see *Métron*, 1925, V. No. 2). He would not bother the meeting with the precise details of his method, but it was interesting to find on comparing his estimates of population for 1941 with those made by Dr. Snow from somewhat later information that they agreed curiously closely. In one respect, however, he thought Dr. Snow was too optimistic, that his estimate of the numbers 0-5 was too high. Professor Greenwood had estimated the future births on the assumption that the rate of decline of absolute numbers would be as observed between 1903 and 1921 (omitting the years of war). That proved to be a considerable over-estimate, 0-5 giving, for instance, 398,000 male births in 1927 instead of fewer than 334,000. In his population for 1941 he had rather fewer than Dr. Snow had, yet his estimate must be of the order of 15-20 per cent. too high, and therefore Dr. Snow's must be also too high. Allowing for that, he surmised that the proportion of the male population under 15, instead of being something like 24-25 per cent., would be of the order of 20-22 per cent.; in 1921 it was of the order of 29 per cent.

So far as the structure of the population was concerned, Dr. Snow's result agreed curiously well with the result of using a slightly different method.

With regard to the economic aspects he had nothing to say because he had little technical knowledge of the subject. He thought,

however, that Mr. Hilton in some of his criticisms had overlooked the fact that there was an essential difference between the effects of migration and those of a falling birth-rate and a falling death-rate.

Dr. Snow was concerned with the economic effect of the change in the age constitution of the population due to the falling birth-rate and not with the effect of migration of adults.

MR. BIRKETT said that most of the points he had wished to make had already been made by previous speakers, but it was only fair to Dr. Snow to say that he did not claim to have discovered the only factor; what he asked statisticians to consider was that among all the various factors that had contributed to unemployment, too little attention had been paid to the declining birth-rate. The great difficulty was to know how great that influence had been, and this emphasized the necessity for an adequate index of production and consumption.

MR. CONNOR said he would like to join with the proposer and seconder in expressing his appreciation of Dr. Snow's paper, and to say that he found himself in general agreement with Dr. Snow's conclusions, subject to the rather strict limitations which Dr. Snow had himself laid down. As time was short, he would confine himself to one or two items of technical interest.

He thought Dr. Snow's weighted population represented a step in the right direction, but he was not quite sure whether Dr. Snow had been able to avoid double-counting. When he showed Dr. Snow's figures to an expert in social work, he was at once met with the criticism that the maximum consumption of a man did not occur at age 30, but that there were two maxima, one occurring at about age 25, and the other in the forties or fifties. During the intervening period part of that man's consumption had been transferred to his children. Whilst the rearing of children might attract a certain amount of family income in the shape of gratuitous social services, relief from income tax, etc., it was a commonplace that a man who had a family was bound to make material sacrifices and reduce his personal consumption, and a realistic solution of the problem should consider not the hypothetical consumption that a man or woman required, but the actual consumption which that man or woman's means allowed of. If the view were taken that children's consuming power was not additive to the consuming power of adults, a first approximation could be got simply by subtracting from the totals the number of children from ages 0-15. The expected rates of growth in the weighted population during the next ten years would thus be increased from 5 to 8 per cent., and from 3 to 9 per cent., and the intensity of the pressure as described in the paper would to that extent be relieved.

In common with Dr. Snow, Mr. Connor was suspicious about the figures of American pay-rolls, and this suspicion was shared by competent American observers. Pay-roll indices had a natural bias upwards, for firms getting into low water tended to get eliminated.

There was another point in the paper that might have borne further development. The older a population, the less courageous, enterprising and adaptable it was. Its will to adapt itself to changing conditions decreased with its age.

Although Mr. Connor did not share Dr. Snow's pessimism, he felt that statisticians ought not to be blind to the solid merits of the paper.

MR. G. H. WOOD said that he wished to draw particular attention to the table on p. 335, as there lay the key to the paper and to the whole of the fallacies. The paper had been discussed, so far, only from the point of view of the relation of the weights in the second column headed "Average Consumption Index." It had been overlooked that a redistribution of these weights would not affect the conclusions of the paper very much. He would like to attack the fundamentals on which the table was based. Any distribution of family expenditure which held good in 1881 would not necessarily hold good now. It was now thirty years since he had read a paper to the Society on a somewhat similar subject, and fifteen years later Dr. Bowley had also dealt with the matter. He would suggest to Dr. Snow that if he would refer back to those papers, and examine the evidence produced of the enormous elasticity of the demand schedule of the British people and the similar state of affairs in the United States, he would find that there was no justification whatever for assuming that the adult section of the British people had reached the final point of absorption in their consumption of commodities. In these circumstances the whole thing went to pieces; Table II became worthless; the facts destroyed the whole of Dr. Snow's conclusions, and therefore also destroyed the paradox discovered by Mr. Hilton.

The PRESIDENT thought the discussion must now be brought to a close, but he would first venture to say a few words, and he drew attention to certain matters in respect of which Dr. Snow had, he thought, not conveyed the impression intended.*

Mr. Flux was sorry to find something he was unable to understand with regard to the figures of the result of the Census of Production. Dr. Snow here said that in 1924 a smaller number of operatives, working on an average forty hours a week, produced a larger number of boots than a larger number of operatives in 1907, working at least fifty hours a week. Mr. Flux did not wish to be drawn aside over the question of "operatives" as against the other side—the management. People wisely employed in administration might contribute more to the output of an enterprise than an increased number of operatives, but the total number of persons employed in 1924 was 147,000, and it was 125,000 in 1907—a difference of 22,000. Dr. Snow had suggested that 20 per cent. less, or 47,000 fewer people must have been employed in making boots and shoes in 1924 than in 1907. Mr. Flux could not understand Dr. Snow's point, and thought he must have failed to express his meaning, as he felt sure he could not mean anything as curiously related to the recorded facts as that

* These portions of the paper have since been modified accordingly.

would be. The only suggestion he made to account for it was that some addition was necessary to the number of people on record in 1924 and not on record in 1907—people engaged in mending boots in workshops. The total valuations recorded would show that nothing like 47,000—not even 4,000 people—could be accounted for by a more complete enumeration of repairers. Mr. Flux could not understand what had happened to the figures there, but he was certain of one thing—that the suggestion that fewer operatives were employed in the business in 1924 than in 1907 was entirely misleading.

There was one other point that had not been touched upon by anyone in the discussion. Unless he greatly misunderstood Dr. Snow's paper, he was asking people to believe that the main trouble was that they were saving too much and that freer spending was the remedy. That was the implication of the whole of his argument. All that Mr. Flux read elsewhere with reference to capital was to the effect that, so far from saving too much, there was not enough saving, and if there was too much saving he failed to understand why, in raising new capital, so high a rate per cent. per annum had to be paid. He did not believe that the suggestion of too much saving could be reconciled with the present facts. One of the important reasons for the present distress was that consumption was high relatively to production; goods immediately available for consumption were preferred to goods of durable productive power—a state of affairs that seemed to be entirely contrary to the point of view put forward by Dr. Snow.

With others who had spoken, he thought that Dr. Snow, in putting forward certain groupings of figures and calling attention to the consequences—industrial and other—that must follow on the change in the age-structure of the community, had rendered an important service, and had certainly done what he could to prevent people from falling into errors. He would hardly venture to suggest that Dr. Snow was echoing the complaints that were found in the newspaper from time to time, that this was the time of the young, and the old were getting in their way, but there was, nevertheless, some unity of spirit between the two points of view.

The Vote of Thanks was put to the meeting and carried unanimously.

DR. SNOW, replying, thanked the members of the Society for the way they had received the paper.

Referring to Mr. Hilton's remarks, he thought that that gentleman had fallen into two fundamental fallacies—(a) the fallacy of confusing association with causation, and (b) the fallacy of generalization from insufficient foundation. Mr. Hilton had said many true things, but they did not appear to have much to do with the paper. He (Dr. Snow), of course, agreed that the number of persons in it was only one variable in determining the size of the market. It happened, however, to be the one he was dealing with, and Mr. Hilton's remarks rather reminded him of a comment on a paper on the effect of rainfall on crops, that the writer of the paper, having

omitted to mention it, seemed to be unaware that the effect of sunshine on crops was important. There were many other factors besides the one discussed in this paper which should be taken into account in a comprehensive review of the situation, but the data for the consideration of some of these were very meagre. The purchasing power of the individual was obviously important, but Mr. Hilton was probably aware that the statistical data bearing on this point (some of which had been examined with a view to use in the paper) showed that the variation in the average purchasing power of individuals over a few years was relatively small. If Mr. Hilton could measure the total spending powers of the visitors to his Fair, he would find that it was much more highly correlated with the number of persons in it than with the purchasing power of the individual.

Referring to Dr. Bonar's remarks, the only point he wished to mention was that of the title of the paper. He did not intend to imply by that title that he thought there was an absolute limit to industrial employment, but rather to indicate that with the progress of the world the proportion of individuals occupied in industrial and allied employment would gradually fall. This was probably merely a truism, as one did not have to look back many centuries to find practically the whole population employed in producing articles to satisfy the primary needs of mankind.

Mr. Burnett-Hurst's remarks interested him very much. In writing the paper he had been concerned only with the practical problem of the effect on industry of decline in the rate of growth of population, but he agreed with Mr. Burnett-Hurst that the idea was a sort of inversion of Malthus' doctrine. It was, of course, in no way a criticism of Malthus, but simply indicated that the present phase of the world's economic development was different from the phase which existed a hundred years or more ago. No theory of the facts could be considered to be absolutely true for all time, but he thought that the words of Mr. Burnett-Hurst, that "industrial output is increasing more rapidly than growth of population, and unless this over-production is prevented by employers a stage will be reached when production will be checked by unemployment," was a good description of the position.

Referring to Mr. Burnett-Hurst's remarks about the economic development of India, he thought that this was rather a second phase of our export development. His references in the paper to export development were more concerned with the first phase, that in which we had to export in order to develop areas abroad to satisfy our primary needs. At that stage there was no obstruction by means of import duties upon the flow of machinery, etc., from this country, but the later phases of our industrial development have been complicated by these obstructions, the consideration of which, however, leads far beyond the limits of the paper.

Referring to Sir Alfred Watson's remarks, Dr. Snow pointed out that he had tried to emphasize in the paper that his distribution of consumption according to age was very tentative, and he thoroughly

appreciated that it was vulnerable to criticism. As other speakers had mentioned, however, it was apparently the first attempt which had been made in this matter, and it was to be hoped that it would lead the way to some more reliable statistics. On the subject of the method by which the estimates of population were made, Dr. Snow mentioned that he had used the method in some work for the Dominions Royal Commission about 1911, and at that time he thought it was original. He found, however, that Professor Cannan had used the method many years previously. He would like to refer to the paper which he had contributed to the Society in March 1915—"The Magnitude of the Population of Great Britain available for Emigration" (*J.S.S.*, Vol. 78). On pages 242 and 243 he gave diagrams illustrating this method of projecting the population forward from one decennial period to another, and the diagrams, he thought, supported the view that this particular method of estimating populations was a satisfactory one.

He had to confess that he had overlooked Professor Greenwood's paper in *Metron*, but was gratified to find that his own results tallied so closely with those of Professor Greenwood. He had himself formed the opinion that he had over-stated the population at the various future dates of the group 0-5, but this over-statement told against the thesis of the paper. If the population at early age groups fell more than he had allowed for, the effect of this on the market for consumers' goods would be all the greater.

Both Mr. Connor and Mr. Wood had referred to the figures giving distribution of consumption of individuals according to age, and he agreed with Mr. Wood that the distribution which was applicable in 1919 was not that applicable in 1881. The point was, however, that the figures for any one particular date were so tentative that to adopt a variation in the figures for different dates seemed to be out of the question.

With regard to the President's remarks relating to the Census of Production figures of the number of operatives in the boot industry at the dates of the two Censuses of Production, he (Dr. Snow) felt he need hardly say that before making the statement contained in the paper he had been into the matter in considerable detail and was very much puzzled by the figures. There had been a considerable change in the boot industry between 1907 and 1921, and the Census of Production results unfortunately could not clearly bring out this difference. That particular industry seemed to be one where the speeding up of production in recent years was far more than was the case in other industries, and he could give a number of illustrations indicating an increase in output which was very much larger than the increase, if any, in employment. One important operation alone in which three pairs of boots had been dealt with per day by hand was now performed so that 400 pairs were done in the same time. This was hardly the place to discuss the matter in detail and he confessed to the complexity of it. He did not see any reason at the present time for withdrawing the view which he put forward in the paper, but he hoped that by bringing the problem into public light,

more investigations might be made which would afford a fuller explanation of the discrepancies.

With regard to the President's remarks upon the relation of consumption to production, there was no doubt room for considerable difference of opinion, but it was clearly not the opinion of those associated with such trades as the textile and boot trades that consumption was high relatively to production. There was a real cleavage of opinion on this point, and it was highly desirable that more information on the subject should be made available.

There was no suggestion in putting forward this paper of attempting any full explanation of the problem of unemployment. There are certainly many factors which affect this, and such questions as the level of prices, credit, foreign tariffs, and many others, all have to be considered in a full description of the problem. Some of these factors are probably more important in the long run than others, while others are more important from the short-period point of view. The problem is not a static one, and the importance of the various factors must change from year to year. It was true, of course, that variations in the credit situation produced fluctuations in the volume of employment; but superimposed on these fluctuations there would be other short-period movements and also general long-period trends. He thought that the slow change in the population distribution described in the paper produced one of these long-period trends. All that was intended in the paper was to indicate that if the effect of all the other factors could be allowed for, the decline in the rate of growth of our population renders an increase in unemployment probable. It would be highly interesting to follow up Mr. Burnett-Hurst's suggestion of ascertaining what proportion of unemployment is due to the various factors, but this would involve a study by the method of partial correlation for which the data are not in existence.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

A. C. Coates.
Louis Rasminsky.

G. D. Rokeling.
John Wishart, M.A.

Corporate Representative.

Harold Edward William Lutt, *representing* the Northern Assurance Company.

THE MOVEMENT OF WAGES IN GERMANY DURING THE DEPRECIATION OF THE MARK AND AFTER STABILIZATION.

By C. BRESCIANI-TURRONI,

Professor at the Egyptian University, Cairo.

[Read before the Royal Statistical Society, April 16, 1929,
The President, MR. A. W. FLUX, C.B., in the Chair.]

1. INTRODUCTION.

2. SOURCES OF THE DATA.

- (a) Statistics of Wage-rates.
- (b) Statistics of the Actual Earnings of Occupied Workers.
- (c) Statistics of Workers' Incomes.
- (d) Statistics relating to the Cost of Living.
 - (i) During the period of inflation.
 - (ii) After the stabilization of the mark.
- (e) Statistics of Consumption.

3. WAGES AND UNEMPLOYMENT DURING THE PERIOD OF INFLATION.

- (a) From the beginning of 1920 to about the middle of 1922.
- (b) From the second half of 1922 to the end of the inflation period.
- (c) Wages of skilled and unskilled workers.

4. WAGES AFTER THE STABILIZATION OF THE MARK.

- (a) The period immediately following stabilization.
- (b) From January 1924 to the present time.
 - (i) The general trends of nominal wages, real wages, and workers' incomes.
 - (ii) Relation between the workers' income and the average output per head.
 - (iii) Cyclical fluctuations in wages and in workers' incomes.

5. CONSUMPTION OF THE GERMAN PEOPLE.

6. CONCLUSIONS.

Appendix I. COMPARISON WITH THE PRE-WAR PERIOD.

Appendix II. EARNINGS OF GOVERNMENT EMPLOYEES AND OF PROFESSIONAL WORKERS.

STATISTICAL TABLES.

1. Introduction.

IN his Presidential Address to the Society, delivered in 1926, Lord D'Abernon made a searching and original analysis of the causes of the depreciation of the mark, and in a masterly fashion traced the main course of events in the history of German currency, from the

outbreak of war to the collapse in the autumn of 1923, and onwards through the period of monetary reform which ended in the introduction of the new Reichsmark.

The present paper is much more modest in scope. Its aim is to depict but a single aspect of the whole interesting and, in its later phases, intensely dramatic story: namely, the effects of the depreciation and of the subsequent stabilization on the economic situation of the working classes, as shown by the movement of wages.

Owing to the inadequacy of the available* statistical material, to which attention has already been drawn by the International Labour Office,* this analysis is necessarily incomplete and must be confined to the indication of broad fundamental tendencies. The period chosen for examination begins in 1920, in February of which year the Statistical Office of the Reich first published its Cost of Living Index. For the period 1914-19 the data are still more fragmentary and heterogeneous than for the subsequent years, and an attempt to analyse them would have brought the paper far beyond the prescribed limits.

2. *Sources of the Data.*

In a study of wages it is necessary to distinguish (a) the standard wage-rate: (b) the total wage of the employed worker: (c) the income of the worker, taking unemployment into account.

(a) *Statistics of Wage-rates.*—In Germany the chief source of wage-rate statistics is afforded by collective agreements.† Before the war the number of workers covered by such agreements was only about 1½ millions, or one-tenth of the total number, and by the end of 1917 the number had fallen to about 900,000; but after the revolution of November, 1918, the system spread rapidly, and towards the end of 1922 the rates of pay of about 14,200,000 wage-earners and salaried workers, or about 75 per cent. of the total working population, were regulated by collective agreements. After 1922 the number of such agreements again diminished, and at January 1, 1927, the number of persons affected was about 11 millions. Although

* "The determination of working-class income has always been a matter of great difficulty, and even an approximately correct estimate can only be achieved after extensive enquiries among working-class families themselves. In addition, to measure the changes which have occurred, several enquiries at different periods would be necessary, conducted on such bases and methods as would render the results comparable. In Germany there had been no such investigations, or at any rate none on sufficiently broad lines to be accepted as representative of the whole country."—*The Workers' Standard of Life in Countries with Depreciated Currency*, Geneva, 1925, p. 11.

† See the official publication, *Die Tarifverträge im Deutschen Reich*, Berlin, 1928.

at the present time a considerable proportion of the workers are not employed under collective agreements, the general wage-rates, hours and working conditions continue to be largely influenced by the terms fixed in such agreements as exist. Both time-rates (rates per hour) and piece-rates are so fixed, the control of the collective agreement extending also to piece-rates.*

The wage-rates obtained from collective agreements do not, however, give an accurate indication of the economic situation of the worker; nor are they even an exact measure of the wage actually paid for an hour's work; in the ascending phases of the economic cycle the rates fixed by collective bargaining often only represent a minimum which is exceeded in actual fact.†

For these and other reasons, the International Statistical Institute has always insisted on the necessity of taking account of the total earnings.‡ At the 17th Session, held at Cairo in 1927/8, following the report of M. Huber,§ a resolution was passed which included the following passage :—

“ The wage to be considered is not that which corresponds to the basic rate, if such there be, but the *total earnings*; it should include, so far as possible, all extra payments—bonuses, social insurance contributions, whether paid by the employer or the worker, and miscellaneous payments, those in kind being reckoned as their money equivalent.”

(b) *Statistics of the Actual Earnings of Occupied Workers.*—In Germany the actual earnings of workers in the mining industry are

* Where there is disagreement between employers and workers an arbitrator appointed by the Government decides between them, and at the request of either party his decision may be enforced by the Ministry of Labour. Latterly changes in wage-rates have frequently been effected through the intervention of the State, but both workers and employers, from different points of view, raise objections to this method.

† According to the enquiry into the wages paid in the German textile industry in September, 1927, the average actual earnings per hour (excluding overtime and insurance contributions) exceeded the agreed rates by 26.6 per cent. for skilled men and 10.3 per cent. for unskilled, the corresponding percentages for women being respectively 17.5 per cent. and 7.2 per cent. The rates are piece-rates for skilled workers and time-rates for the unskilled. The enquiry took place in a period of economic expansion when there was an intense demand for labour. In the succeeding months many agreements ran out, and as in the new ones the rates fixed were considerably higher, the difference between the rates and the actual earnings per hour was considerably less (see *Wirtschaft und Statistik*, 1928, p. 163).

‡ Prof. Ricci, in an article published in the *International Labour Review* for 1926 (Vol. 13, p. 489), analysed the elements which make up the total earnings.

§ Huber : “ *La comparaison internationale des salaires réels.* ”

regularly published;* but only fragmentary figures are available for other industries. An enquiry into wages took place in February, 1920,† and a law passed in 1922 made it compulsory for the Government to obtain information with respect to wages; but for several years the disorganization and disturbance resulting from the monetary instability made any such undertaking impossible. The work actually began in September, 1927, with an enquiry into wages in the textile industry.‡ In March, 1928, an enquiry took place respecting the wages paid in the woodworking industry;§ and in the meantime, an investigation of the actual earnings had been made by the Association of the German Workers' Syndicates.|| From an investigation of these figures, however, it appears that some constituents of the total wage were not included in the calculations. For example, in the figures for miners' wages no account is taken of overtime pay, nor of the free coal and housing accommodation at reduced rates allowed to the workers.¶ And none of the statistics include the employers' contributions to various kinds of insurance.**

The Berlin Institut für Konjunkturforschung, which is officially in connection with the Statistical Office of the Reich, has now begun to compile detailed statistics of the contributions paid by wage-earners and other employed persons to national old age and disability insurance funds. For the purposes of this insurance, the insured persons are graded according to their earnings and the amount of the contribution varies in the different grades; thus by making use of these figures the Institute has calculated the distribution, according to weekly earnings, of German wage-earners and salaried workers covered by the insurance scheme, for each month beginning with

* For a summary of these statistics see *Statistisches Jahrbuch für das deutsche Reich*, 1928.

† This related to the earnings during four weeks of 1,559,954 wage-earners and 226,521 salaried workers employed in 11,697 undertakings.

‡ This enquiry covered 36,519 workers belonging to certain branches of the textile industry situated in nineteen different districts (see *Wirtschaft und Statistik*, 1928, No. 5).

§ *Wirtschaft und Statistik*, 1928, p. 15.

|| The enquiry relates to the actual earnings of 145,497 workers in twenty-two industries, situated in fifty-four towns, during the working week November 2-7, 1926. Figures for the succeeding years were published in the *Gewerkschaftszeitung*, the organ of the German Workers' Associations.

¶ These various supplementary benefits form a considerable proportion of the total earnings, as may be seen from the figures of miners' earnings given by Baumont in *La Grosse Industrie Allemande : le Charbon*, 1928, p. 59 foll.

** These contributions are important. In 1927 the total receipts of the insurance organizations amounted to 4.1 milliards of gold marks, of which about 2 milliards represented contributions paid by employers. To this must be added substantial Reich and State subsidies.

January 1927.* These figures, while undoubtedly of value, are still far from giving a satisfactory estimate of the total wage of the worker. Although the law requires that the contribution to old age insurance shall be proportionate to the total earnings, in practice the declared wage is often less than the amount actually received, especially as regards agricultural workers, who are paid partly in kind. Again, the figures take no account of the employers' contributions nor of sundry other benefits accruing to the worker. And, lastly, the data are not homogeneous. No distinction is made either of sex or age, so that the tables include a large number of young persons living at home and earning very small sums. The statistics published by the Institut für Konjunkturforschung do not therefore give a true picture of the economic situation of the workers, and an average wage figure based on them would have very little meaning. (According to the Institute, in the first half-year of 1927 the average monthly wage of German workers was between Rm. 92·72 and Rm. 99·71.)

(c) *Statistics of Workers' Incomes.*—A satisfactory measure of the economic situation of the working classes can only be derived from figures of average income, taking account of unemployment and short time; and in order to eliminate the effect of seasonal variations in employment the calculation should be based on *annual* income. In practice, however, it is exceedingly difficult to make a correct estimate of the average annual earnings, since this would involve ascertaining the details of the weekly or monthly payments received

* The figures for the first quarter of 1927 are as follows:—

Wage-earners.			Salaried Workers.		
Weekly Wages.	Distribution of Workers	Proportion of Aggregate Wages.	Monthly Earnings.	Distribution of Workers.	Proportion of Aggregate Salaries.
marks.	%	%	marks.	%	%
Not exceeding 6	6·3	1·6	Not exceeding 50	19·8	6·1
From 6-12	16·9	6·4	From 50-100	17·6	8·1
„ 12-18	20·2	12·6	„ 100-200	32·7	29·9
„ 18-24	12·5	11·0	„ 200-300	17·5	26·6
„ 24-30	9·4	10·6	„ 300-400	8·0	17·0
Above 30	34·7	57·8	„ 400-500	3·9	10·8
			Above 500	0·5	1·5
	100·0	100·0		100·0	100·0

These figures relate to about 15 million wage-earners and 2·6 million salaried workers, and the total of the payments involved is estimated to average 1,900 million marks per month. It should be noted that very few salaried workers receiving more than 500 marks a month are included, since such employees are not subject to compulsory insurance.

by a sufficient number of individual workers during the whole of the year under review.

Figures of family budgets, in spite of their admitted defects, are useful in estimating the incomes of working-class families, since they have the merit of treating the family as an economic unit. But such statistics are very scarce in respect to Germany. In 1907 the German Statistical Office made an important enquiry into working-class budgets, but no statistics of the kind were compiled in the years following the war, and for those years there exist only a few data obtained by private investigation (as, for example, the figures compiled by Henriette Fürth, published in various issues of the *Wirtschaftskurve der Frankfurter Zeitung*). In 1927 the Statistical Office undertook a budget enquiry covering 1,500 families, but at the time of writing (December, 1928) the results have not been made public. At the present moment only two statistical documents of importance in this connection are available, and the sample in each case is too small to be representative.*

It is clear, from the foregoing analysis, that the only data which can properly be used in studying the changes in the economic situation of the German working classes are the wage-rates fixed by collective agreements (using, where mine-workers are concerned, figures which represent the total earnings of those actually employed. Because the total earnings of the workers are subject to large fluctuations owing to periods of total or partial unemployment, the index constructed from the movements of wage-rates has been corrected by means of figures obtained from the unemployment statistics (See Section 4).

(d) *Statistics relating to the Cost of Living.*

(i) *During the period of inflation.*—The foregoing paragraphs all relate to nominal wages. We now pass on to examine the possibilities afforded by the official statistics for the calculation of an index of real wages. In view of the urgent need of obtaining a statistical measure of the increase in the cost of living which could be used as a basis for wage negotiations between employers and workers, in February, 1920,† the German Statistical Office began

* These are: (a) an enquiry undertaken in 1926 by the Hamburg Statistical Office into the economic situation of families in modest circumstances. It relates to 300 Hamburg families, comprising 1,069 persons, and includes wage-earners, salaried workers, and teachers. The results of this enquiry were published in the *Statistische Mitteilungen*. (b) An enquiry into the economic situation of commercial employees made by the Commercial Employees' Association of Hamburg. This enquiry refers to 1926, and covers 290 families, consisting of 1,029 persons. The result appeared in a brochure entitled *Der Haushalt des Kaufmannsgehilfen*, Hamburg, 1928.

† A preliminary attempt was made in December, 1919.

the regular publication of a cost-of-living index.* The method of calculating this index was as follows:—the first step was to determine the quantities of goods which would normally be consumed by a family of five persons (father, mother, and three children aged respectively 12, 7, and 1½). To begin with, the only items included were food, rent, heating, and lighting, but in 1922 clothing was added and the index was then re-calculated for the previous period. Now, in 1920 the economic conditions of the war period were still in force, in that prices and consumption were still controlled by the Government; and the theoretical expenditure of a working-class family was accordingly arrived at by applying the official prices to the quantities of goods consumed; but in cases where the quantities fixed for the normal budget exceeded the amounts which could be bought at the official rates, the excess quantity of each item was multiplied by the open market prices, or, ultimately, by the prices charged by the *Schieber*, or illicit profiteers.

The method employed by the German Statistical Office is thus that of the *fixed budget*. As was said at the last session of the International Statistical Institute (Cairo, 1927/8): “No comparisons of real wages can be entirely satisfactory unless the mode of life of all the workers concerned does not vary greatly during the period under review from that corresponding to the typical budget used as a basis for the calculations.”† This fixed budget was modified from time to time in view of the seasonal variations in the consumption of certain commodities, and further modifications in the quantities of the component items became necessary with the cessation of rationing and of price control. These modifications were carried out in such a way as to leave unchanged the total number of calories represented by the food-stuffs in the budget, and as they were not large enough to affect the aggregate index to any important extent, it was considered that the comparability of the figures was not injured thereby.‡

The index is based on the current prices of the years 1913–14, and the data were collected in seventy-two different districts chosen as representative. An index is first calculated separately for each district, and the aggregate index for the Reich is weighted according to the populations of the separate districts.§ At first the prices were collected once a month, then (from 1922 onwards) twice a

* See *Vierteljahrshefte zur Statistik des Deutschen Reichs*, 1920, I. p. 158.

† See also the Report of the International Economic Conference on the Standard of Living of Workers in Various Countries, Geneva, 1926.

‡ *Wirtschaft und Statistik*, 1925, p. 159.

§ For further details of the weighting process see *Wirtschaft und Statistik*, 1925, p. 159.

month, until in March, 1923, the precipitous fall of the mark made a weekly index necessary.

The method just described was followed during the whole of the inflation period, and in spite of its defects the resulting index is regarded by eminent German statisticians as a sufficiently satisfactory measure of the variations which took place in the cost of living from the beginning of 1920 till nearly the end of 1923.*

The determination of the level of real wages in a period of rapid monetary depreciation such as that which was suffered in Germany in 1923 offers an interesting problem in statistics. The worker spends his wages in the days following their receipt. If the cost-of-living index for successive weeks be represented by $C_1, C_2, C_3 \dots$ and the nominal wages received each week by $S_1, S_2, S_3 \dots$, since in general the wages are paid at the end of the week and spent during the succeeding week, the index of real

wages † will be *not* $\frac{S_1}{C_1} \frac{S_2}{C_2} \dots$, but $\frac{S_1}{C_2} \frac{S_2}{C_3} \dots$. If the monetary depreciation proceeds slowly the difference is not very important, but in periods of rapidly rising prices the purchasing power of the wages may be very much less when they come to be spent than at the time when they were received.

In a study of wages in Berlin in 1922 and 1923 Prof. Meerwarth constructed an index of real wages comparing the wages paid on the Friday with the cost-of-living index-number for the seven days period beginning with the Saturday of the same week.‡ In the conditions prevailing in 1923, however, not even this method could give satisfactory results. As Dr. Mommer has pointed out, it is not very probable that at a time when the currency was falling rapidly the worker would spend his wage in such a way as to distribute it evenly over the week which followed its payment. It is much more likely that he would hasten to make the necessary purchases the moment he received his wages. Moreover, in 1923 the methods of payment were frequently changed and they varied considerably from industry to industry.§ In the summer of that year, in response

* See on this subject Nathan: "Ueber die Berechnung von Indexzahlen für die Lebenshaltungskosten" (*Jahrbuch für Nationalökonomie*, 1923).

† The monthly indices of real wages given in Table I are arrived at by dividing the monthly wage-index by the monthly cost-of-living index calculated from the end of the first week of a given month to the end of the first week of the next month. This is the method followed by the German Statistical Office.

‡ Meerwarth: "Zur neuesten Entwicklung der Löhne" (*Zeitschrift des preussischen Statistischen Landesamts*, 1923).

§ Mommer: "Löhne und Gehälter im Jahre 1923, und ihre Kaufkraft" (*Vierteljahresberichte des Thüringischen Statistischen Landesamts*), 1928, p. 183.

to a demand by the workers, it became customary to advance part of the wages on Tuesday, the remainder being paid on Friday; later on, in many industries wages were paid three times a week, and, ultimately, every day. Although these different methods of payment did not alter the amount of the nominal weekly wage received, they obviously caused great changes in its real value. At the beginning of November, 1923, it made a great difference to the worker whether he received his wages in the morning or the afternoon.

For all these reasons it is clearly impossible to make an accurate calculation of the real wages of the German workers during 1923. Even the official figures which furnished the data for the diagrams shown later should be accepted with reserve.

(ii) *After the stabilization of the mark.*—After the stabilization of the mark it became necessary to revise the index of the cost of living. Owing to the rapid improvement in the situation of the working classes which took place, as we shall see, in 1924, the composition of the typical budget on which the index was based became further and further removed from reality. Articles of better quality than those originally taken as representative began to be more generally consumed; also, it was now high time to complete the family budget by the inclusion of the "miscellaneous expenditure" which had until then been omitted on the ground that owing to the extreme limitation of purchasing power during the inflation period the total amount of such expenditure must be insignificant. On the other hand, even in the new index no account was taken of taxes or of insurance contributions.

The following table shows the relative importance of the several expenditure groups in the typical budget :

Food	54.77 per cent.
Rent	20.35 „
Heating and light	5.55 „
Clothing	10.05 „
Miscellaneous expenditure	9.28 „

100.00

The revision of the index was accompanied by a minute checking of the pre-war prices used as the base. This involved the examination of about 15,000 separate prices. The new cost-of-living index which resulted was about 10 per cent. higher than the old one. The new figures were not published until February, 1925, but the indices for the preceding months, back to January, 1921, were re-calculated

according to the new method. Since there was no longer the same need for a weekly index, the calculation has since that time been made only once a month.

(e) *Statistics of Consumption.*—The results obtained from the wage statistics may be checked by the figures of working-class consumption. Unfortunately, in Germany there are no statistics giving the consumption of the working class separately from that of the rest of the community. There are, however, figures relating to certain articles of general consumption such as beer, tobacco, sugar, etc., and since the workers' expenditure accounts for a large proportion of the community's total expenditure, statistics of the aggregate consumption may serve as an approximate index of the variations in the consumption of the working classes. In interpreting the significance of the statistics of consumption it must be remembered that, as a rule, while the total expenditure in food increases in absolute amount, it diminishes relatively to the increases in income.* However, the figures of German family budgets seem to indicate that some commodities do not follow this rule. For example, the expenditure on butter, which is 2 per cent. where the income is under 2,500 marks, rises more rapidly than the income, reaching 3.50 per cent. for incomes of 6,000–7,000 marks. Conversely, expenditure on inferior fats falls quickly as the income rises. Expenditure on fruit remains at the same low relative level in all the budget grades. On the other hand, expenditure on clothes, household furniture, laundry, medical services, education, and domestic service increases more in proportion than the income.†

Since the available figures of consumption include only a small number of the commodities consumed, it is necessary to guard against the danger of a wrong interpretation. It is quite possible that an increase in the consumption of a given commodity may be due, not to a rise in consumers' income, but simply to its substitution for a superior quality of the same commodity or for other commodities which have risen in price. For example, the abnormally large consumption of cocoa, which is noticeable in some periods in Germany, was not an indication of greater prosperity, but, on the contrary, because cocoa was used as a substitute for more expensive food-stuffs, such as meat. In the years immediately succeeding the war the consumption of salt increased because salt

* From the statistics analysed in Section 5 it would appear that when the income of a social class moves from a very low level to a higher one, the expenditure on food increases, broadly speaking, proportionately to the increase in income.

† See the publication of the Hamburg Statistical Office on Family Budgets, mentioned in the footnote to p. 379.

had to take the place of various other condiments which were no longer imported from abroad.

Sometimes an increase in the consumption of a certain article was due to a change in taste, such as has contributed to the recent large increase in the consumption of bananas and other tropical fruits in Germany. Another instance of a change in taste is the diminution in the consumption of alcohol.

Until 1920 the principal articles of consumption were controlled by the Government, but since a clandestine trade in such articles was being carried on simultaneously, the official statistics were far from complete. For example, the apparently sudden increase in the consumption of meat in the last quarter of 1920 was really due to the abolition of rationing and the consequent closing down of the illicit butchers' shops, which caused an increase in the number of animals brought to the public slaughter-houses. Because of the defective nature of these statistics the present examination has not been carried back beyond 1921.*

3. *Wages and Unemployment during the Period of Inflation.*

(a) *From the beginning of 1920 to about the middle of 1922.*—As has been said, this investigation does not go back to the period of the war. It should be recalled to mind, however, that in Germany, as in other countries, that period was characterized by a relative scarcity of labour. Owing to the enormous demand for labour in the war industries, the "industrial reserve," including the portion normally composed of women, practically disappeared, and with it unemployment.† But the effect of the scarcity of labour in raising wages was neutralized by the operation of other factors, of which the chief was the continuous depreciation of the mark.

During the war false notions were current in Germany, as elsewhere, with respect to the high levels reached by wages. The statistics showed that in truth real wages were considerably lower than before the war, except in the industries producing war material.‡ The revolution of November, 1918, conferred great benefits, both political and moral, on the workers. The famous "Magna Charta of Labour," as one writer called it, which was signed on the 15th of

* The figures of consumption used for the purpose of this paper were taken from the Reports of the Agent-General for Reparation Payments as regards 1924 and later years, and for previous years from the official figures published in *Wirtschaft und Statistik*.

† Kessler: "Die Lage der deutschen Arbeiterschaft nach 1914," in *Strukturentwicklungen der deutschen Volkswirtschaft*, 1928, Vol. I. p. 438.

‡ Wilbrandt: *Die moderne Industriearbeiterschaft*, 1926, p. 1928; also "Lohnpolitik und Lohnentwicklung im Kriege" (*Zeitschrift des Preussischen Statistischen Bureaus*, 1919).

November, 1918, by the foremost German employers and by representatives of Labour, settled the fundamental principles by which the relations between capital and labour were to be regulated in the new republic. These were: recognition of the trade unions as representing the working classes; determination of the conditions of work in each industry by collective agreements between employers and workers, and the establishment of workers' committees to supervise the carrying out of the terms agreed upon; affirmation of the principle of the eight-hours day; reorganization on an equal representation basis of the employment exchanges; the setting up of conciliation committees for the different industries, which should consist of equal numbers of employers and workers, and of a central Council to deal with disputes affecting more than one industrial group.

The majority of the principles laid down in the "Labour Charter" ultimately received legal sanction; Article 165 of the Weimar Constitution recognizes the right of the workers to meet the employers on equal terms to discuss matters concerning labour; there are other laws and ordinances which relate to the eight-hours day, works councils, social insurance, unemployment, collective bargaining, employment exchanges, etc.*

Owing to the important part played by the socialist workers unions (*freie Gewerkschaften*) after the revolution, their membership greatly increased. The aggregate membership, which was $2\frac{1}{2}$ millions in 1913, but had fallen by the end of the war to 1.7 millions, rose to 5.5 millions in 1919, and to 7.9 millions in 1920.† At the same time the salaried workers also organized themselves and turned towards the left. Their three main associations had a total membership of 1.6 millions in 1920.

In the political field the Labour leaders acted with great wisdom and moderation; faced with the alternatives of either unchaining the forces which were making for a violent social revolution and the dictatorship of the proletariat, or of energetically opposing the disruptive tendencies and preparing the way for a liberal government acting in co-operation with the democratic parties, they deliberately chose the latter course.

The working class then became and still remains the strongest pillar of the new German State constituted at Weimar. The Weimar constitution endeavoured to reconcile parliamentarism and syndication by means of a so-called "social liberalism," which was, in fact,

* See "Denkschrift über die seit dem 9 Nov. 1918 auf dem Gebiete der Sozialpolitik getroffenen Massnahmen," Berlin, 1919 (Drucksachen der Nationalversammlung, 215).

† See *Jahrbuch des Allgemeinen Deutschen Gewerkschaftsbundes*, 1927, p. 225.

liberalism modified in deference to the weight possessed by the Labour movement, with its powerful unions and its fervent ideals and aspirations. Germany's social stability was proved by her success in surmounting the grave crises of 1919-1923 without resort to any form of dictatorship, and so preserving intact the political liberties guaranteed by the new constitution.

From the point of view with which we are here particularly concerned, the chief consequence of the revolution was a considerable increase in wages. In this connection it may be remembered that the German workers' unions were often accused of having wanted the revolution only as a means of obtaining higher wages.* According to the official German figures, from 1918 to 1919 the average real wages, stated as a percentage of the pre-war real wages, did rise as follows:—miners (hewers), from 63·7 to 82·4; skilled railway workers, from 83·3 to 92·2; unskilled workers, from 99·8 to 119·8. But the monetary inflation practically wiped out these advances, so that the workers did not really benefit by them. In fact, from the end of 1919 until 1924 German wages were affected chiefly by monetary causes,† that is, by the results of inflation up to November, 1923, and subsequently by those arising from the stabilization of the mark.

The effect of the inflation on wages varied in the different stages of the monetary depreciation. Up to about the end of 1922 the main effects were as follows:—

- (i) Nominal wage rates followed—with a time-lag—the rise in prices caused by the inflation. In other words, real wages decreased.
- (ii) This effect on the workers' incomes was partly compensated for by the increase in the amount of employment which accompanied the depreciation of the mark.

The curves of Diagram I represent: ‡

- (A) The course of the dollar exchange (1913 = 1);
- (B) Index of wholesale prices (1913 = 1);
- (C) Index of the cost of living (1913 = 1);

* As Wilbrandt says *op. cit.*, p. 128, "Die Revolution brachte einen Lohn-
taumel."

† This phenomenon was not confined to Germany. In all countries with a depreciated currency, the most important of the factors influencing wages in these later years was the instability of the value of money (Richardson: "Some Aspects of the Fluctuations and Tendencies of Wages in Various Countries in Recent Years," *International Labour Review*, February, 1928).

‡ The figures relating to prices, cost of living, dollar exchange and wages were taken from the publication of the Central Statistical Office: *Zahlen zur Geldentwertung*, 1925. The unemployment statistics are regularly published in the *Reichsarbeitsblatt*.

- (D) Index of nominal wages of hewers which have been taken as representative of those of the working class in general (1913 = 1);
- (E) The percentage of unemployment among members of the workers' unions;
- (F) Real wages of hewers expressed as a percentage of the 1913 wage.

The first four curves are drawn to a logarithmic scale.

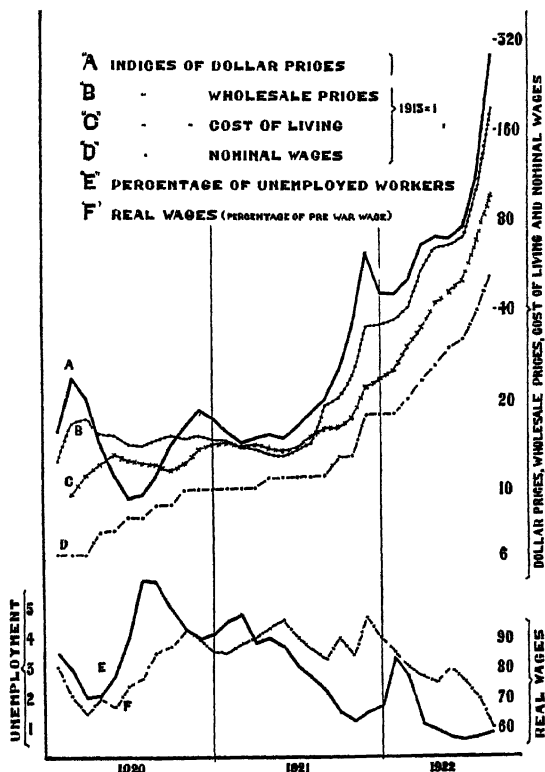


DIAGRAM I.

At the beginning of 1920 the course of the dollar exchange suddenly moved from 15.43 to 23.60 paper marks, and the wholesale price-index rose from 12.6 to 16.9. The index of the cost of living having also risen, real wages decreased, but there was a simultaneous decrease of unemployment. Then came a brief period of improvement in the mark (in June, 1920, the dollar exchange was 9.32), during which, as may be seen in the business records of the time, German

industries, especially the exporting industries, found themselves in serious difficulties. Unemployment again increased, but real wages tended to reach again the level of the beginning of the year. In the second half of 1920 the new fall of the mark brought about an improvement in the situation of the labour market; unemployment quickly diminished again (except for slight seasonal decreases), when, towards the end of 1921, a rapid rise occurred in the dollar exchange. The records of business done relating to the end of 1921 and the first quarter of 1922 bear witness to a brisk activity in many industries, especially those manufacturing goods for export and capital goods used for production. During this period real wages suffered a great decrease—for example, the real wage of the hewer, which in the middle of 1921 was about 95 per cent. of the pre-war figure, fell to 50–60 per cent. of that figure towards the end of 1922;* but the number of unemployed workers was the lowest recorded since the war—on October 1, 1922, only about 16,678 persons were receiving unemployment benefit. Diagram I clearly shows the inverse relation between the course of the dollar exchange (curve A) and that of unemployment (curve E).

It is not difficult to discover the connection between the two effects of currency inflation, *i.e.* a decrease in real wages and an increase in the amount of employment. Owing to the decrease in real wages and the other advantages which they derived from the depreciation of the mark, the German industrialists had a considerable amount of liquid assets at their disposal; it was, in fact, to them that the new masses of paper money ultimately found their way. It is true that all the undertakings were not in an equally favourable situation, but the results of the inflation cannot be fully analysed here, and for our purpose the broad effects will suffice.

The abundance of monetary capital which characterized the early phases of the inflation stimulated the demand for labour, and the new workers were mainly absorbed by industries producing capital goods.† The increase in the number employed was, however, conditional on the availability of the other factors of production, such as coal, for instance; and the quantity of coal at disposal was

* According to Prof Meerwarth (*op. cit.*), real wages in the industries he examined towards the end of 1922 were below the minimum necessary for existence.

† The effect of currency depreciation in increasing production, which is denied by many economists, was recognized by Thornton: "It must be admitted that, provided we assume an excessive issue of paper to lift up, as it may for a time, the cost of goods though not the price of labour, some augmentation of stock will be the consequence; for the labourer, according to this supposition, may be forced by this necessity to consume fewer articles, though he may exercise the same industry." (*An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, London, 1802, p. 263.)

somewhat inelastic owing to the difficulty of effecting a very rapid increase in production, and to the obligation with respect to coal deliveries imposed by the Treaty of Versailles. Also it was difficult to effect a rapid increase in the imports of raw materials from abroad. But although the inelasticity of the supply of the concomitant factors of production acted as a drag on the expansion of the demand for labour, the facts show that this demand was on the whole very elastic during the depreciation of the mark. Every increase in the demand for labour tended to bring about an immediate rise in nominal wages, which, however, was quickly neutralized by the rise in prices inevitably resulting from new emissions of paper money by the Government, and real wages remained at a low level.

In other words, owing to the depreciation of the mark and the consequent decrease in real wage rates, the flow of commodities which maintained a given number of workers before the inflation provided the wages of a larger number.

(b) *From the second half of 1922 to the end of the inflation period.*—This period was characterized by a great increase in nominal wage-rates, which, in contrast to the experience of the preceding years, rose even more rapidly than the wholesale price-index and the dollar exchange. This is clearly shown in Diagram II, the curves of which represent:—

- | | |
|--|--------------|
| (A) The movements of the dollar exchange; | } (1913 = 1) |
| (B) Wholesale prices; | |
| (C) Nominal wages of mine-workers (hewers); | |
| (D) The percentage of unemployment among members of the workers' unions; | |
| (E) Real wages of hewers expressed as a percentage of the 1913 wages.* | |

The first three curves are constructed on a logarithmic scale.

The high increase in nominal wages was due in great part to the influence of the workers' unions. After the decrease in real wage-rates caused by the depreciation of the currency in 1922 they made various attempts to secure for the worker a real wage which should be independent of fluctuations in the value of the mark. In the summer of 1923 the system of fixing wages on the basis of the official cost-of-living index came into general use. Later, still more elastic methods were tried.

But the aim of the unions was never attained. On the contrary, the statistics show that real wages were extraordinarily variable during the year 1923. Each new sudden descent of the mark (*e.g.* in

* The wage statistics published by the Central Statistical Office have taken into account the methods of payment (see Section 2, d).

January, 1923, following the invasion of the Ruhr; and in May of that year, after the failure of the attempts of the Reichsbank to stabilize the exchanges) brought about a decrease in real wages, to which the working classes replied with a demand for higher nominal wages. Sometimes they were able to secure a real wage which was comparatively high—about the same as that of the pre-war period;

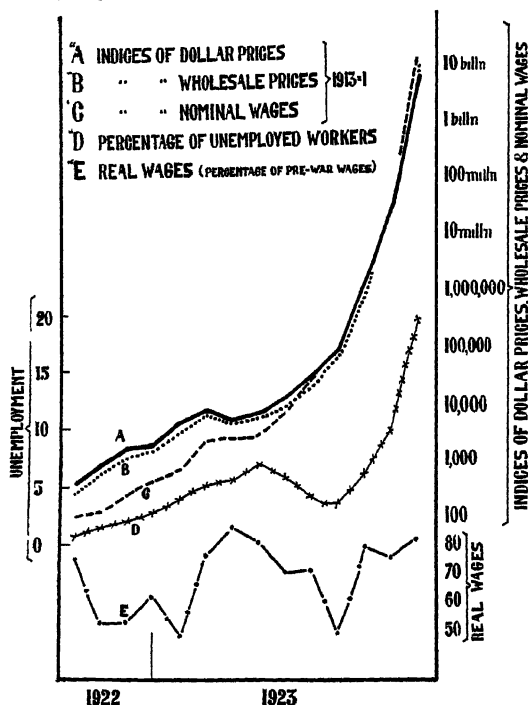


DIAGRAM II.

but sooner or later a new fall in the mark considerably reduced the real value again.

According to the official figures, in January, 1923, the real wage of the miners was 47.7 per cent. of the pre-war amount; in March it was 86.2 per cent.; in July it was 47.6 per cent., and in October 81.2 per cent. Still greater differences are observable in the weekly figures of real wages. Diagram III shows the weekly wages (time-rates) of workers in the metal industries of Thuringia, taken from careful calculations made by a German writer.* The diagram gives a striking picture of the variability of wages during 1923.

* Soecknick: *Die Löhne in der Nachkriegszeit*, 1926, p. 37: For the variations in weekly wages see also the article by Meerwarth "Die Entwicklung der Löhne im Jahre 1923" in *Finanzpolitische Korrespondenz*, 1924, No. 12.

Owing to these excessive fluctuations in wage-rates, the loss in economic welfare suffered by the working classes through the monetary depreciation was still greater than the difference between the real wage of the depreciation period and the pre-war wage.

The effect of unemployment on the worker's total income must also be taken into consideration. Contrary to the experience of the preceding period, from the end of 1922 onward the monetary depreciation and the rise in prices were accompanied by an *increase* in unemployment, as shown in Diagram II (curve D).^{*} It may appear strange that one and the same cause, namely, currency depreciation, should be capable of producing such opposite effects. The apparent paradox is explained by the fact that currency depreciation creates a demand for labour when the rise in wages lags behind the rise in wholesale prices, but it has not that effect when

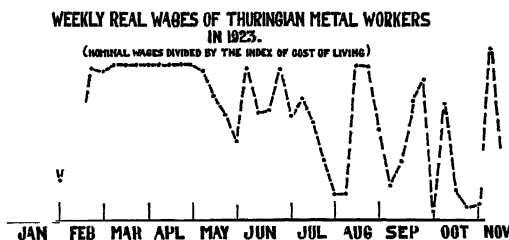


DIAGRAM III.

wages have become so much more sensitive that they rise simultaneously with prices.

If the curve of unemployment is compared with that showing the ratio between the indices of nominal wages and wholesale prices, it will be noticed that they have a definite statistical relation to one another which is valid for the whole period of the inflation (Diagram IV). Broadly speaking, it is evident that unemployment tended to diminish in the periods which show a decreasing ratio between the index of nominal wages and that of prices, and to increase with the increase of that ratio.[†]

No attempt has been made to calculate the income of the worker during the inflation period, because of the extreme uncertainty respecting some of the factors which have to be taken into account.

^{*} There was also the experience of other countries with depreciated money after the rise in prices had gone beyond a certain limit. See the article 'The Unemployment Crisis,' *International Labour Review*, 1924.

[†] By this it is, of course, not meant that the rise in nominal wages was the only or the most important cause of the unemployment experienced in 1923. The cause is to be found in the utter disorganization of economic life brought about by economic disturbances such as the fall of the mark, and by political events such as the occupation of the Ruhr.

Suffice it to note that the International Labour Office, in the study already referred to, arrived at the conclusion that the income of the worker increased from 1920 to 1921 and diminished during 1922 and 1923. This conclusion is confirmed by the statistics of consumption, to which we shall presently direct our attention.*

(c) *Wages of skilled and unskilled workers.*—Another characteristic of the inflation period was the lessening of the difference between the wage-rates of different categories of workers:—skilled and unskilled, youths and adults, men and women. The causes of this are well known and are not confined to Germany.† The fall of the

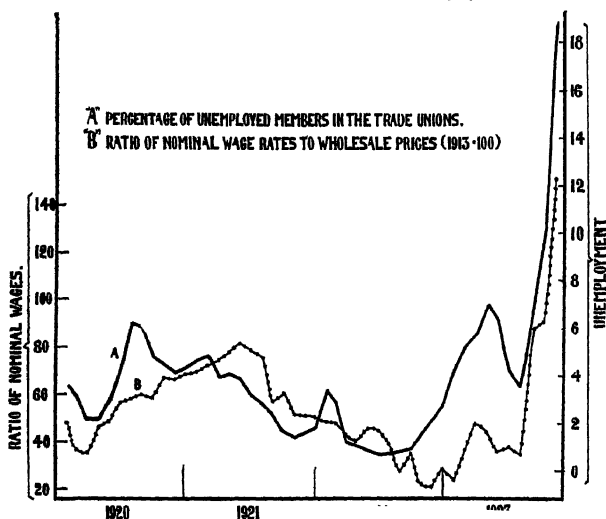


DIAGRAM IV.

mark soon brought down the real wages of the unskilled workers nearly to subsistence level, and as the fall continued the nominal wages of this class had to be raised, while the wages of the skilled workers could still bear some reduction. Then, after the end of the war an immense number of unskilled workers poured into the unions, with the result of greatly increasing their power of obtaining rises in wages, and further, as Meerwarth observed, whether because of the stoppage of migration from the country to the towns and industrial

* On the condition of the working classes in Germany during the period of inflation see also *Die Lage der Arbeiterschaft in Deutschland* (Internationaler Gewerkschaftsbund, Amsterdam) and Wissell: *Lebenshaltung der deutschen Arbeiterschaft seit dem Kriege* (in the volume, *Deutschland, Jahrbuch für das deutsche Volk*, herausgegeben von Kulz, 1927).

† See *Wage-Changes in Various Countries, 1914-1921*, published by the International Labour Office, Geneva.

centres (which had always been in the main a migration of the unskilled), or because of the active demand for labour which continued until the middle of 1922, there was no longer, as in pre-war times, an excess of supply of unskilled labour. The figures referred to in the foot-note show that the ratio between the wages of skilled and unskilled workers diminished in the period 1914-1922 from 145.9 to 106.8.* Moreover, the workers' organizations were able to make their influence felt by causing the difference between the rates paid to young and to adult workers to be decreased with the object of preventing the employment of youths in preference to older men.

4. *Wages after the Stabilization of the Mark.*

(a) *The period immediately following stabilization.*—After the reform of the currency very low rates of wages prevailed. The large amount of unemployment and the weakness of the workers' unions, whose funds had been practically wiped out by the depreciation of the mark, gave the employers command of the situation, and they took advantage of it to reduce wages, on the grounds that only by such reduction would German industry be enabled to meet foreign competition. At the same time the employers endeavoured to extend the working day, and eventually obtained from the Government the decree of November, 1923, which, although it did not do away with the principle of the eight-hours day, suspended its application in practice.†

In other countries stabilization of the currency has been followed by unemployment; in Germany, the gravity of the economic crisis lessened by slow degrees after the checking of the inflation. First came a reduction in the number of workers on short time, and later in the number of the totally unemployed.

* On the basis of the data given in *Zahlen zur Geldentwertung* I have calculated the following index of the rates paid to skilled workers employed by the State Railways, expressed as percentage of the unskilled rate (annual averages, but for 1923 average of the period January-October).

1913	.	.	.	.	145.8	1919	.	.	.	112.2
1914	.	.	.	.	145.9	1920	.	.	.	109.2
1915	.	.	.	.	143.8	1921	.	.	.	108.5
1916	.	.	.	.	136.2	1922	.	.	.	106.8
1917	.	.	.	.	125.6	1923	.	.	.	105.5
1918	.	.	.	.	121.8					

† In the first year of the stabilization (1924) there were fewer strikes than in the preceding year (13.4 million working days were lost in 1924, 23.4 millions in 1923, 32.5 millions in 1919). On the other hand, the number of lock-outs was much greater: 22.8 million lost days in 1924 against 4.4 millions in 1922, and 0.6 million in 1919.

(b) *From January 1924 to the present time.*

(i) *The general trends of nominal wages, real wages, and workers' incomes.*—From January, 1924, onwards the Central Statistical Office began to publish figures of the wage-rates paid under collective agreements in twelve important industrial groups. These figures showed the highest rates paid to adult workers (including supplementary payments for a wife and two children) in the chief centres of the industries concerned. The Statistical Office itself calculated weighted averages of the rates, those of skilled and of unskilled workers being separately shown.

These data afford very valuable material for the study of wage movements from the beginning of 1924 to the present day. Diagram V shows :—

Curve W. Movements of nominal wage-rates per hour.

„ R. „ of real wage-rates per hour.

„ I. „ of real incomes of the workers calculated by the method explained in the foot-note.*

For all these curves the average of the years 1924–26 is taken as 100. The wages and income shown are those of the unskilled worker; but practically the same results would have been shown if those of skilled workers had been taken.

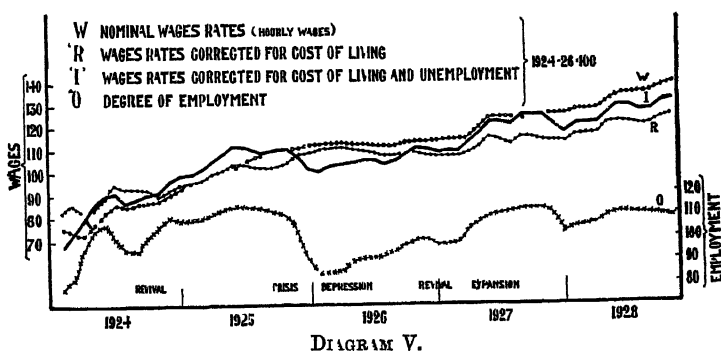
Curve O of Diagram V shows the fluctuations in the amount of

* The index of real wage-rates has been corrected by means of the employment figures. From 1924 onwards the amount of employment has varied greatly from time to time, and this was probably the most important cause of the variations in the workers' income. The method employed in constructing curve I is that explained in Annexe III of the International Labour Office publication already referred to (*The Workers' Standard of Life in Countries with a Depreciated Exchange*). The amount of employment has been calculated from the published statistics of the workers' associations, which show the proportion of their members on short time as well as of those totally unemployed. These figures, of course, do not cover the whole of the working population, but in the absence of complete information they may be taken as fairly representative; it is also necessary to assume that the proportion of unemployment was substantially the same for skilled as for unskilled workers. In order to determine the extent to which the workers' wages were reduced by unemployment, both total and partial unemployment were taken into account, as were also the allowances paid to the totally unemployed. These allowances were considerable in amount; at the beginning of 1928 the maximum allowance (*i.e.* that paid to a worker with a family in the category known as *Wirtschaftsgebiet II*) was equal to about half the average wage, as is shown by the figures of the Central Statistical Office. By a decree of February, 1924, the allowances paid to workers on short time, which had previously been compulsory, were made optional and were to be paid by the municipalities; it is therefore impossible to include them in the calculation.

occupation (the percentage of occupied members of workers' associations, taking account also of part-time workers).

In regard to curve I, the reservations already referred to must be borne in mind: no account has here been taken of several important elements which entered into the total wage, in particular, of overtime and piece-work.

The notable increase in wage-rates which took place in the early part of 1924 was a reaction from the excessively low rates of the period immediately following the stabilization. After the middle of 1924, by which time the currency was firmly reinstated, the monetary factor was no longer the preponderant cause of wage movements. From that time forward wages appear to have been influenced by the progressive stabilization of German economic life, one result



of which was, consequently, to increase the average output of the worker; they were also modified by various temporary and cyclical fluctuations in the economic situation.

The nominal wage-rate per hour increased in the period we are considering from 42.2 pf. in January, 1924, to 80.4 pf. in October, 1928.*

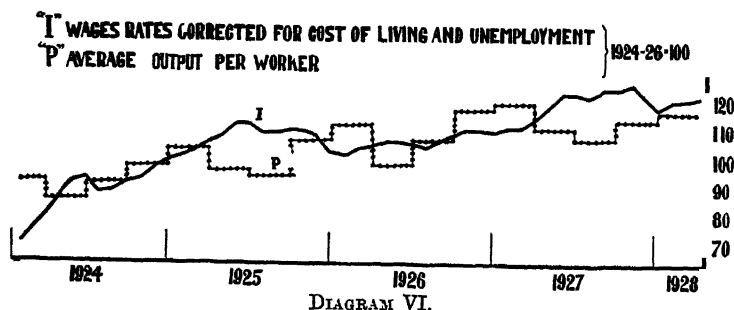
The great improvement in the workers' incomes which took place in 1924 was due to the combined effect of the increase in wage-rates and the decrease of unemployment. But from 1925 onwards the

* After the stabilization of the mark the increase in wage-rates was greater for skilled than for unskilled workers. This was partly due to a decrease in the influence of the unskilled workers on the policy of the unions, millions of whose members fell away during the period of widespread unemployment. The percentage of skilled wages to unskilled was 131.4 in January, 1924; it rose during the year to about 1.40 and remained thereabout for some time (in the first half of 1928 it was a trifle lower). This ratio between the wages of the two categories is somewhat different from that existing in 1913 (i.e. 150.2 according to the figures given in the *Statistisches Jahrbuch des deutschen Reichs*).

general trend of working-class income was chiefly affected by the increase in nominal rates, as Diagram V clearly shows. In June 1925 the number of unemployed was 4.6 per cent. and the index of workers' incomes stood at 110.8, while in October, 1928, the income index had risen to 131 although the percentage of unemployed was then 8.8.

(ii) *Relation between the workers' income and the average output per head.*—Diagram VI represents the movement of the workers' income (curve I) and the average output per head (curve P) during the period 1924–28.* This curve shows a distinct increase in average output from 1924 onwards.

In the early stages of the inflation, production had received a stimulus owing to the increased demand for labour, and therefore the number of employed workers had also increased; but in the

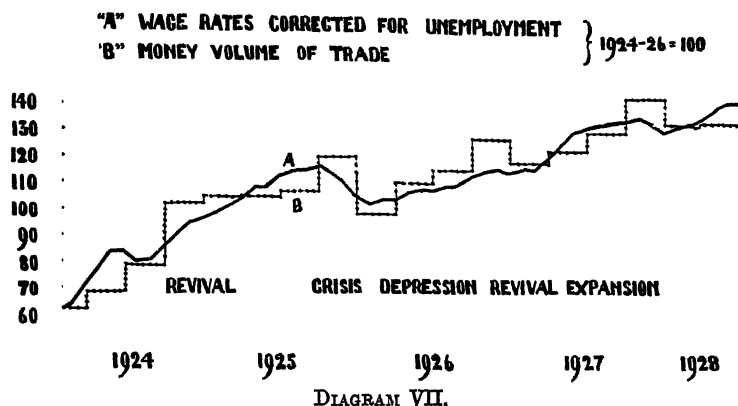


later stages the inflation was the cause of a serious decline in the productivity of labour. On the one hand, it increased the proportions of unproductive as compared with productive workers, as is shown by the "hypertrophy" of commercial and banking organizations, the growth of speculation in exchange and in stocks and shares, and the increase in the number of clerical as compared with manual workers. The average output of the workers engaged

* Various figures relating to certain German industries, especially the coal and iron industries, show that the average output per worker increased from 1924 onwards. But there exists no general index of average output. I have attempted to construct a broadly correct index by the following method:—the Institut für Konjunkturforschung publishes an Index of Production (which, however, does not cover all German industries); and the census of 1925 gives the total number of those employed in industry; on the evidence of other figures it may be assumed that from 1924 onwards the working industrial population increased each year, on the average, by 200,000–300,000 persons. The total number employed has been calculated by taking the estimated number of the working-class population and applying the monthly figures of unemployment percentages published by the workers' associations. Dividing the index figures of production by the index of employment we get curve P of Diagram VI.

in production also decreased, and, moreover, it has been shown by careful investigation made in Germany that the quality of the work also deteriorated during the time of extreme depreciation of the mark.* This was due partly to the physical enfeeblement of the workers as a result of the lowered standard of living, partly to the unrest produced by the perpetual fluctuations in their incomes, the uncertainty of the outlook, and the incessant discussions with the employers on the question of wages.

The stabilization of prices had an immediate psychological effect on the efficiency of labour, and this was still further improved by the reorganization of the methods of production.† The increase in the



productivity of undertakings due to the employment of more scientific methods enabled higher wages to be paid.‡

The relation of wage-movements to the general economic trend is shown also in Diagram VII. A general idea of aggregate economic activity is given by an index of the volume of business. As regards Germany, this index can easily be calculated from the figure of the yield of the turnover tax (*Umsatzsteuer*).§ Diagram VII shows the

* The studies published in the *Frankfurter Zeitung* (see *Wirtschaftskurve*, 1926) show that taking for the index of quality 1921 = 100 as base, this index fell to 82 in October, 1922, and to 64 in October, 1923, but recovered to 99 in January, 1924, and rose to 128 in the following April.

† For an important analysis of the causes affecting the efficiency of German labour see *Verhandlungen und Berichte des Unterausschusses für Arbeiterleistung*, Berlin, 1928.

‡ Conversely it was often the rise in wages that forced the owners to adopt more efficient methods of production.

§ In the details of this calculation see the author's *Considerazioni sui barometri economici*, 1928.

correlation between the movement of workers' income (curve A) and that of the volume of business (curve B).

(iii) *Cyclical fluctuations in wages and in workers' incomes.*—As has been seen, from 1924 onwards the *general trend* of wages of working-class income was chiefly influenced by the economic progress of Germany and by increase in the output per worker. In addition, Diagram V shows that the *fluctuations* in the workers' income were mainly due to fluctuations in the amount of employment, which in their turn closely followed the course of the economic cycles.

Various phases are distinguishable in Germany's recent economic development. After a period of depression which lasted until August, 1924, came a revival which was due in great part to the faith which sprang up and spread among the employers after the London Agreement on Reparations and to the subsequent influx of foreign capital.* But in the autumn of 1925 a serious crisis occurred and was followed by a wave of depression which continued until the second half of 1926, when an improvement took place which extended in 1927 to the whole of German economic life. The year 1927 was a time of rapid expansion, but the pace slackened during 1928.

During the earlier expanding phase (September, 1924–July, 1925) both nominal and real wage-rates increased, and the workers' incomes showed a still greater rise than the wages owing to the decrease in unemployment. During the crisis and the depression (from September, 1925, to the early part of 1926) nominal wage-rates did not fall, owing to the power then possessed by the workers' unions; when prices fell the *real* rates increased. But the unions were powerless to prevent a decrease in the workers' incomes due to the growth of unemployment. The decrease would have been much greater if it had not been for the unemployment subsidies. With the renewal of industrial activity in the second half of 1926 the workers' incomes slowly rose as unemployment diminished.

In the new period of expansion which followed (1927) the workers' unions took advantage of the favourable position to demand a rise in wages, and since unemployment was still diminishing the real income of the workers substantially increased. Thus economic fluctuations undoubtedly had an appreciable effect on working-class income. Their influence, however, was not so great as might at first appear. We saw from the calculations shown above (see Table VII) that in the most favourable months of 1925 the index of real income was 111 and in the most unfavourable part of 1926 it was 100; and if averages of several months' income be taken the difference is even less, although it is true that the index figures do not include

* The economic situation of Germany after 1924 is clearly described in the various reports of the Agent-General for Reparation Payments.

overtime pay, of which, naturally, more is earned during a period of expansion than in times of depression; again, during the crisis and the subsequent depression the fall in working-class income was lessened by the receipt of unemployment pay (which is included in the above figures).

In this relative stability of the workers' incomes throughout the successive phases of the economic cycle probably lies the explanation of a rather surprising fact which has emerged from recent German statistics, namely, the very slight sensitiveness to economic fluctuations shown by the consumption of food-stuffs.

Diagram V shows that the workers' incomes underwent also a series of *seasonal* fluctuations, which were chiefly due to variations in the amount of employment. Probably the difference between real income in the winter and in the summer is greater than it appears in the diagram owing to changes in the distribution of working-class expenditure, which are masked by the use of a fixed budget.

The German statistics do not show how the ratio of the total wages paid to the value of the total product of industry varies during the course of an economic cycle.

5. *Consumption of the German People.*

The preceding conclusions, which are based on the variations in the income of the wage-earners, can be checked by means of the statistics of consumption. Diagrams VIII and IX, which have been constructed from the official figures, show the consumption of *meat*,* *beer*, *sugar*, and *tobacco*,† and the net amount of *coffee* imported.

An examination of these diagrams reveals, first, a great diminution in consumption from the end of 1921 to the end of 1923, *i.e.* during the period of extreme depreciation of the mark; ‡ secondly,

* The figures do not include total consumption, but only the meat from public slaughter-houses plus net imports, *i.e.* about 80 per cent. of the total consumption.

† The diagram shows a sudden rise in consumption in October of 1923 followed by a great fall. These variations were due in great part to the changes in the taxation on tobacco which took place in this period. The diagram does not show the actual consumption but the amount of tobacco taxed during each quarter.

‡ The statistics of meat consumption reveal some curious facts which throw light on the social conditions in Germany in 1922 and 1923. While the consumption of the better qualities of meat (beef, veal, pork, and mutton) decreased, the consumption of horse and especially of dog-meat increased, a proof, as was observed by a writer in *Wirtschaft und Statistik*, of the growing misery of the people. From the fourth quarter of 1921 to the fourth quarter of 1922, the number of pigs killed fell from 1,416,051 to 1,131,148, while the

a considerable increase in consumption after the stabilization; and it will be seen that on the whole the amount of consumption was very little affected by the crisis and depression of 1926. The total values, on the basis of retail prices, of the selected articles (which

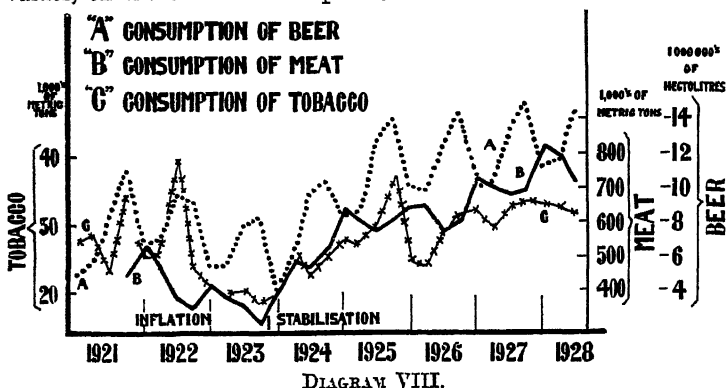


DIAGRAM VIII.

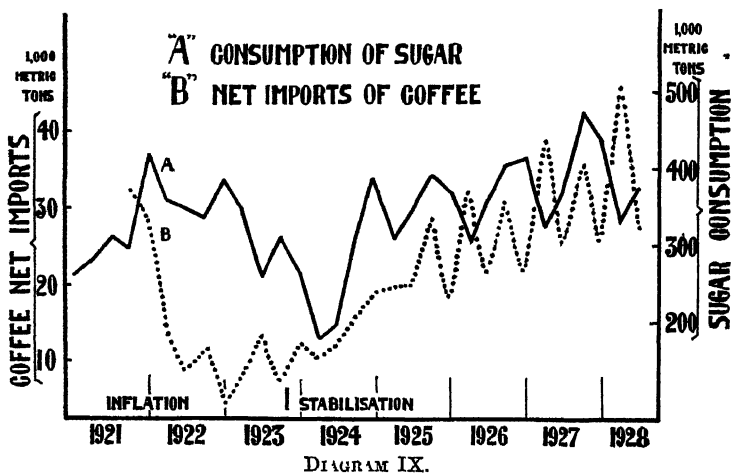


DIAGRAM IX.

were, in 1927, approximately as follows: meat, 8 milliard marks; beer, 3.5 milliards; tobacco, 2.5 milliards; sugar, 1 milliard;

number of horses killed rose from 30,967 to 47,652. During 1923 the consumption of pig-meat continued to decrease. In the same period the situation of some classes grew so much worse that they had to restrict their consumption even of horse-meat, and that of dog-meat increased. The figures show that 1,090 dogs were slaughtered in the third quarter of 1921; 3,671 in the third quarter of 1922; 6,430 in the third quarter of 1923. Immediately after the stabilization the consumption of pig-meat rose considerably, while that of dog-meat diminished. In the end quarter of 1924 the number of dogs killed was only 81.

coffee, 0.5 milliard) have been used in constructing the weighted index of aggregate consumption represented in Diagram X (curve B), together with the movement of the average of the workers' real income (curve A). The parallelism of the two curves may be explained by the fact that at the beginning of 1924 wages and consumption were very low, so that the worker took advantage of a rise in his income to increase his consumption of food-stuffs.

The statistics relating to the consumption of manufactured goods are very fragmentary. Some information is obtainable from the imports of certain materials used in industry, also the Institut für Konjunkturforschung has lately published indices of retail sales of articles of dress, furniture, etc. These figures again testify to the great drop in the consumption of the civil population which took place during the inflation period; and show, moreover, that the

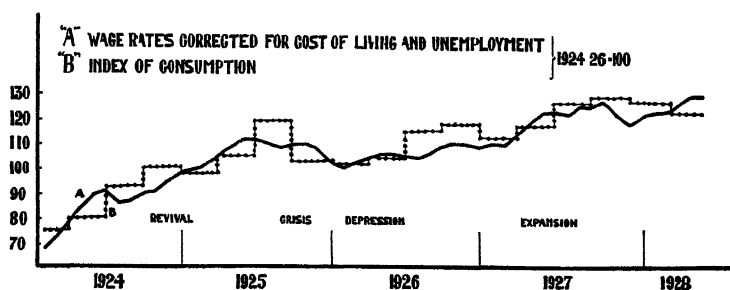


DIAGRAM X.

reduction was of such magnitude that in 1921 and 1922 the German textile industry was forced to develop its export trade on account of the restricted internal demand.* The consumption of textiles rose considerably after the stabilization of the mark, especially in respect of articles of working-class consumption; while the consumption of luxury goods, such as fine textiles, furs, perfumes, jewellery, costly furniture, *objets d'art*, etc., decreased in the period immediately following the stabilization, the reason evidently being that the big profits made by all kinds of speculators during the inflation period had come to an end.

Attention may be directed to another important category of expenditure, namely, that on housing. During the inflation the number of houses built annually was much below the pre-war figure. After the stabilization, building received a stimulus owing to the large means placed at the disposal of public authorities, and in 1927 the pre-war production was probably exceeded.

An index of income fluctuations based on consumption statistics

* *Wirtschaft und Statistik*, 1922, p. 365.

must be supplemented by statistics of savings. The figures of savings banks deposits,* which are derived mainly from the working and lower middle classes, increased in the period under review; they also show a remarkable stability throughout the successive phases of the economic cycle.

The examination of other kinds of statistics bearing on the situation of the working class cannot be attempted here; but it should be remembered that after the stabilization the institutions concerned with social insurance and co-operative trading were able to begin the reconstruction of their capital, which had been almost entirely destroyed by the depreciation of the mark, and once more became an important factor in the welfare of the workers.†

6. *Conclusions.*

The result of the foregoing examination is to show that the economic position of the workers improved considerably from 1924 onwards. The average real income of the worker rose in spite of the large amount of unemployment, and, moreover, the income was much less variable than during the inflation. Although the available data are not complete enough to show whether the average working-class income increased more or less than that of other social classes, or than the total national income, it is nevertheless certain that the recent improvement in Germany's economic situation has brought substantial gains to the working class. In this connection we must not overlook the effect of the foreign credits granted to Germany after 1924 in increasing the demand for labour and raising wages.

This evidence of amelioration does not, however, enable us to make any definite pronouncement as to the present position of the working classes—in the absolute sense. A careful examination of

* *Excess of new Deposits over Withdrawals in the Savings Banks of the Reich*
(in millions of marks).

	1925.	1926.	1927.	1928.
1st quarter	—	411	619	788
2nd „	—	318	327	444
3rd „	—	349	320	485
4th „	236	385	328	571

† For example, towards the end of 1923 the capital of the institutions on which the sickness insurance funds were based amounted to barely 250 million gold marks, compared with 2,100 million marks at the end of 1913. In the latter part of 1927 the capital had risen again to 840 millions. The wide extension of social insurance in Germany is well known; in 1927 22 million workers were insured against unemployment, etc. (For the reconstruction of social insurance after the stabilization see Kreil: *Sozialversicherung und Wirtschaft*, 1928.)

the situation would show that the economic position of numerous groups of workers, such as agricultural labourers, women, and workers in particular groups of industries, is very far from being favourable. But the aim of this paper is only to investigate the changes in the general economic situation of the working classes which have taken place in the last few years.

APPENDIX I.

Comparison with the Pre-war Period.

Is the present economic position of the working classes (*i.e.* at the end of 1928) better or worse than before the war?

It is difficult to give a definite reply to this question, both because of the complex nature of the problem and because of the scarcity of the data. There is little statistical material relating to the pre-war period which is both relevant and trustworthy; moreover, comparison is difficult since pre-war and post-war statistics are not homogeneous. Before the war collective agreements were comparatively few, and in general the pre-war wage statistics referred to figures of average earnings obtained by dividing the total wage-bill of a given industry by the total number of hours worked.*

Even when the pre-war statistics related to wage-rates fixed by collective bargaining, these rates refer to categories which were often in reality not the same as those similarly described in the post-war statistics.

If it is difficult to obtain comparable statistics of wage-rates, it is still more difficult when we come to the total earnings. The question of real income brings in a new complication. The fixed budget method gives adequate results when it is used over a comparatively limited number of years (*e.g.* the period 1924-28); but its efficiency is open to grave doubts in comparing periods so far apart as the years 1913 and 1928, when important changes are known to have taken place in the distribution of the expenditure between the different items. For instance, the housing conditions of the German worker are now in general worse than formerly, and he spends relatively less on his housing, but, on the other hand, he probably spends more on sport and amusements, and has also become accustomed to eat more butter and smoke more tobacco than he used, while he is spending less than before on alcoholic drinks.

The German Statistical Office (see *Statistisches Jahrbuch*, 1928,

* Soecknick: *Die Entwicklung der Reallöhne in der Nachkriegszeit*, Jena, 1927, p. 17.

p. 370) calculated the average weekly wages paid in a number of industries in 1913. Using these figures as a basis for comparison, with those given for October 1, 1928, we obtain the following results:—

Industry.	Skilled Workers. marks.			Unskilled Workers. marks.		
	1913.	Oct. 1, 1928.	1913=100.	1913.	Oct. 1, 1928.	1913=100.
Coal	39.06	58.14	148.8	23.70	41.22	173.9
Metal	36.92	48.89	132.4	23.55	36.15	153.5
Chemical	32.99	49.63	150.4	26.78	41.04	153.4
Building	37.88	64.32	169.8	29.76	53.00	178.1
Wood-working	32.49	56.18	172.9	23.58	48.42	205.3
Paper-making	21.57	39.79	184.5	17.73	35.78	201.7
Printing	31.65	53.72	169.8	25.20	46.76	185.5
Textiles	25.04	36.82	147.1	19.01	30.86	162.3
Brewing	37.33	59.58	159.6	30.21	52.70	174.4
Food-stuffs	28.84	48.67	168.8	23.45	41.95	178.9
Cardboard box- making	26.88	44.35	165.0	19.88	37.34	187.8

According to these figures the rise in nominal wages of unskilled workers and also of several categories of skilled workers * was greater than the rise in the cost of living, as shown by the index figure for October 1, 1928 (152, 1); the Statistical Office, however, warns us that the data for 1913 and 1928 are not homogeneous, and therefore not properly comparable.

In comparing the present economic situation of the working classes with that existing in 1913 it is necessary to take into consideration several factors besides the wages of the occupied worker. Unemployment affects the average income of the worker more now than in 1913. In spite of the stabilization of the mark, the great variations in the amount of employment which have taken place since 1924 have caused the workers' income to fluctuate much more than in pre-war days. At the same time, we should beware of taking the over-pessimistic view of these facts current in Germany, where unemployment has been frequently looked upon as an indication of "over-population" in the sense of an inequilibrium between the population and the means of subsistence. If it were true we should find that unemployment

* In the enquiry already referred to relating to wages and to textile industries, an attempt was made to compare the wages of the present period with those of 1913. Taking into account both taxation and social insurance contributions which are now higher than formerly, the real wages of the textile workers exceeded those of the pre-war period by 4.6 per cent. for skilled and 7.4 per cent. for unskilled male workers.

was accompanied by a decrease in real income and an increase in mortality,* whereas the average income per head of the population has been steadily rising since 1924, and the most recent statistics of mortality do not give an unfavourable picture of the vital conditions of the German people.† The variations in the amount of employment are not surprising, in view of the intensity of the economic crisis evoked by the currency inflation and the many difficulties which beset and retarded the gradual return to stable conditions. Moreover, the immense amount of unemployment at the end of 1925 and the beginning of 1926 was mainly the result of the "rationalization" of German industry.

There are certain other circumstances which have to be considered in comparing the average worker's income of 1928 and 1913. At the present time an adult worker has fewer dependents than before the war. There are no complete recent statistics relating to the size of families in Germany (the full results of the 1925 census are not yet available), but such figures as exist indicate that the proportion of the population at ages under fifteen diminished considerably between 1910 and 1925.‡ To which must be added the fact that a larger proportion of the members are now employed outside the home. This applies especially to the women members. One of the outstanding features of the 1925 census is the great increase in the number of occupied women, namely, 5,200,000 more than in 1907, against an increase of 3,700,000 in the number of occupied men. In 1907 30·5 per cent. of all women were occupied, and in 1925, 35·6 per cent.

One factor which cannot be evaluated is the amount of benefit which the working classes derived from the public utility undertakings financed out of public funds, such as the creation of parks, people's clinics and hospitals, places of recreation for the young, etc. During the period of inflation the amount of money available

* Rumelin : *Die Ueberbevölkerungsfrage*, 1881.

† The new German mortality tables (1924-26) show that for all age-groups the expectation of life greatly increased compared with the decennium 1901-10 (see the article "Die Lebensdauer der Reichsbevölkerung nach der neuen deutschen Sterbetafel" in *Wirtschaft und Statistik*, 1928).

‡ "Alter und Familienstand der Bevölkerung nach der Volks- und Berufszählung von 1925," *Wirtschaft und Statistik*, 1927. For the under-mentioned States the comparative figures were as follows :—

	1910.	1925.
	Population under 15	
	years of age.	
	(Percentages)	
Bavaria	34·4	27·1
Wurttemberg	34·3	26·7
Baden	33·8	26·7
Hamburg	27·6	19·7

for such works was limited, but after the stabilization large sums were spent by the municipal authorities, and much criticism was directed against them on this account.

The housing situation is now substantially worse than in 1913.* It is difficult to arrive at a general decision when so many opposing factors are involved. In the opinion of well-known German economists, and competent business men, during 1928 the workers in general again reached the same standard of life as in 1913, and the unskilled workers had even risen slightly above it.†

Moreover, on the whole the working hours are shorter than in 1913, although the principle of the eight-hours day, the adoption of which appeared to be one of the most important victories by the revolution of November, 1918, is by no means strictly adhered to in practice.

The influences of the working classes on the conditions of work is greater than in the past owing to the spread of collective bargaining and to the law establishing Works Councils, although the hopes of the workers in the results to be attained by this law have proved in a great measure illusive. The system of social insurance has been greatly developed; it now applies to categories of workers not formerly included, and the system has been extended to insurance against unemployment. The contributions payable by the workers are, however, heavier than before the war.

APPENDIX II.

Earnings of Government Employees and of Professional Workers.

In the pre-war period the salaries of those employed by the Reich were regulated by the law of July 15, 1909. This law was considerably modified during the inflation by another of April 30, 1920, and further changes became necessary in the succeeding years on account, first, of the continued depreciation of the mark and, later, of the effects of stabilization.

* According to the census of dwellings of May 16, 1927, taken in a number of German communes, which together included about 70 per cent. of the total population, about 800,000 families were without homes of their own. The communes not included in the census were mostly rural districts. The position was especially bad in the large cities, where 10.3 per cent. of the total number of families were homeless. ("Die Wohnungszahlung im Deutschen Reich vom 16 Mai 1927," *Wirtschaft und Statistik*, 1927.)

† Sering: *Deutschland unter dem Dawes Plan*, 1928, p. 161. See also *Report of the Commissioner of the Reichsbank*, December 10, 1928, p. 48; and the speech by Dr. Schröder in the Preussischer Landtag on February 19, 1929.

Diagram XI is based on the figures published by the Central Statistical Office.* It shows the real salaries of typical employees of high grade (curve A), medium grade (curve B), and low grade (curve C). The real salaries were arrived at by dividing the nominal salaries by the cost-of-living index—this was Calwer's index until 1920, after which year the official index-number was used. The diagram shows that the real salaries of all classes of employees were below the pre-war level throughout the war and the inflation period; but the decrease was relatively greater in the higher and middle than in the lower grades.

In September, 1923, the higher grades were receiving only 44·5 per cent. of their real pre-war salary, the middle grades 57·6 per

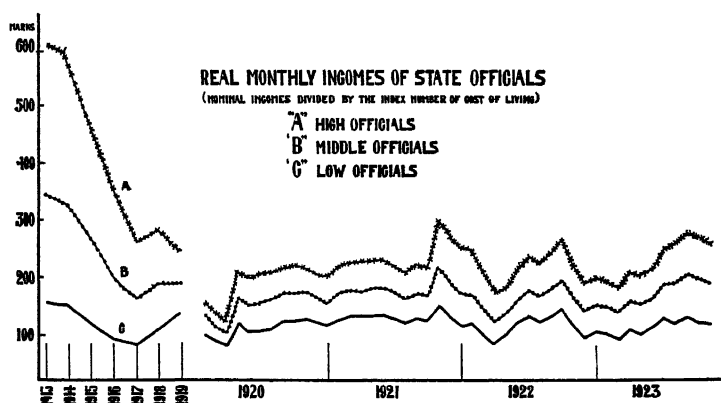


DIAGRAM XI.

cent., and the lower grades 80 per cent. Like real wages, real salaries underwent great fluctuations during the period of rapid depreciation which began in the autumn of 1921.†

After the stabilization of the German exchange, salaries were fixed in terms of gold marks by the decree of December 12, 1923, at rates considerably lower than the nominal pre-war level, and these cannot be taken as normal. At that time the chief preoccupation of the German Government was to assure the success of the monetary reforms by means of a rigorous limitation of expenditure. As the financial situation improved more rapidly than had been hoped,

* *Zahlen zur Geldentwertung*, p. 43.

† The Statistical Office points out that from 1920 onwards real salaries were calculated on the basis of the cost of living in the period during which the salary was expended, and in the last phases of the inflation the mode of payment was also taken into account (advances, supplementary payments, etc.); but that in spite of this, for reasons similar to those indicated in respect of wages, the results should be considered as approximate only (see Section 2, (d)).

official salaries were increased during 1924 (decrees of March 20, May 24, November 25, 1924). From December 1, 1924, to December 16, 1927, the basic salaries remained unchanged, but the housing allowances were raised in accordance with the progressive increase in legal rates of rent. A new and substantial increase in salaries was granted by the law passed in December, 1927 (with retrospective effect as from October 1), which also made important changes in the grading of the employees. Comparisons with 1913 are not easy to make because of these changes; moreover, the results are different according as we take as representative of the current situation the salaries of married or unmarried men, and use initial rates, final rates, or an average rate which can be calculated in several different ways.

The following table taken from the German Statistical Year-book compares the 1913 and the present rates of salary for some classes of officials. By "average salary" is meant the salary of those of the average length of service in each category.

*Average Monthly Salary of Employees of the Reich (in marks),
including allowances for rent.*

After October 1, 1927.

Grades.	1913.	Unmarried. 1913 = 100.		Married. 1913 = 100.	
	marks.	marks.	%	marks.	%
1	994	997	100.3	1,067	107.3
2c	533	651	122.1	721	135.3
4b	408	474	116.2	537	131.6
7	275	297	108.0	353	128.4
10	165	196	105.9	252	136.2
12	149	179	120.1	235	157.7

(The following are examples of the types of officials represented in the respective categories shown above:—1. Heads of Departments. 2c. Chief Postmasters. 4b. Chief Inspectors. 7. Departmental Secretaries. 10. Lower grades postal clerks. 12. Postmen.)

The increase in nominal salaries as compared with 1913 was less than the rise in the cost of living (the index-number of which stood at 150.2 in October, 1927) except for married employees of very low grades. But in order to obtain a more accurate measure of the variations in real wages we need a special cost-of-living index calculated for this class of employees, since their family budgets are very different from those of the wage-earners on which the official number is based. As has been confirmed by a recent enquiry,* the items included in

* *Op. cit.*, "Der Haushalt des Handlungsgehilfen."

"Miscellaneous Expenses" figures much more largely in the budgets of salaried workers than in the fixed budgets used by the Statistical Office, and this fact is important because the prices of the articles which come under the heading "Miscellaneous" have risen more than the general average of prices.

No statistics of income relating to the professional classes are available. But it is well known that during the inflation period the economic situation of a large part of such classes (doctors, private teachers, artists, and other intellectual workers) was even worse than that of the manual workers and State employees.* Doctors, for example, were seldom called in by private patients, and fees paid by the sickness insurance organizations, whose financial position was endangered by the depreciation of the currency, were much below the pre-war scale.† Expenditure on medical and other personal services (as, for instance, education) is very elastic, as is confirmed by some recent German statistics.‡ The few statistics which exist show that the proportion of income spent on food rose continuously during the inflation period. For this reason the expenditure on the services of doctors and others belonging to the liberal professions was necessarily much reduced, and the income of these classes decreased more in proportion than income in general. After the stabilization of the currency the incomes of the professional classes (*e.g.* of doctors) rose again in consequence of the increase in the incomes of the wage-earners and others engaged in the production of material goods.

Generally speaking, the stabilization of the mark benefited not only the working class, but also strengthened the position of the middle classes—including the middle categories of those engaged in industrial and agricultural occupations. Of this, the reconstruction of the Schultz-Delitsch and Raffaisen Co-operatives is sufficient proof. Both the capital and the deposits of these institutions are now lower than in 1913, but considerable progress has been made by them since the inflation, which ruined their finances.§

* H. Guradze and K. Freudenberg in the article entitled "Das Existenzminimum des geistigen Arbeiters" (*Jahrbuch für Nationalökonomie*, 1923) estimate that in 1922 and 1923 the income of the intellectual worker was beneath the subsistence level.

† Gunther: "Die Anpassung der Sozialversicherung an die Geldentwertung und Lohnsteigerung" (*Jahrbuch für Nationalökonomie*, 1923).

‡ According to the Hamburg enquiry into family budgets already cited (p. 3), expenditure in medical services amounted to 1.63 per cent. for families with incomes below 2,500 marks, and to 7.53 per cent. for those with incomes over 7,000 marks.

§ See *Jahrbuch des deutschen Genossenschaftverbandes*, 1927, and *Fünfzig Jahre Raffaisen*, 1877-1927 (1928). Another sign of the improvement in the position of the middle classes is the reconstruction of the private insurance societies, whose capital was almost entirely destroyed during the inflation period.

TABLE I. *Index-numbers, 1920-23.*

	Wholesale Prices. (1913 = 1.)	Nominal Wages. (1913 = 1.)	Real Wages. (1913 = 100.)	Unemployment (percentage of un- employed members of trades unions).
1920.				
Jan.	12.56	6.0	80.0	3.4
Feb.	16.85	6.0	70.2	2.9
Mar.	17.09	6.0	62.7	1.9
Apr.	15.67	7.2	69.3	1.9
May	15.08	7.3	66.4	2.7
June	13.82	7.9	72.6	4.0
July	13.67	7.9	74.4	6.0
Aug.	14.50	8.7	84.6	5.9
Sept.	14.98	8.7	85.9	4.5
Oct.	14.66	9.8	91.6	4.2
Nov.	15.09	9.9	88.4	3.9
Dec.	14.40	9.9	85.3	4.1
1921.				
Jan.	14.39	10.0	84.4	4.5
Feb.	13.76	10.0	87.3	4.7
Mar.	13.38	10.0	88.0	3.7
Apr.	13.26	10.4	92.2	3.9
May	13.08	10.7	95.9	3.7
June	13.66	10.8	92.9	3.0
July	14.28	10.9	86.5	2.6
Aug.	19.17	11.0	81.9	2.2
Sept.	20.67	12.7	89.9	1.4
Oct.	24.60	12.8	82.2	1.2
Nov.	34.16	17.6	97.5	1.4
Dec.	34.87	17.8	90.5	1.6
1922.				
Jan.	36.65	18.1	83.1	3.3
Feb.	41.03	20.3	78.8	2.7
Mar.	54.33	23.3	76.3	1.1
Apr.	63.55	26.1	73.8	0.9
May	64.58	30.4	80.7	0.7
June	70.30	32.7	75.7	0.6
July	100.59	41.0	69.5	0.6
Aug.	192.02	55.4	59.1	0.7
Sept.	286.98	100.5	70.5	0.8
Oct.	566.01	133.8	51.6	1.4
Nov.	1,151.01	261.8	52.6	2.0
Dec.	1,474.79	452.3	62.2	2.8
1923.				
Jan.	2,785	696	47.7	4.2
Feb.	5,585	2,115	75.6	5.2
Mar.	4,888	2,430	86.2	5.6
Apr.	5,212	2,430	79.9	7.0
May	8,170	3,067	69.6	6.2
June	19,385	7,640	70.8	4.1
July	74,787	27,621	47.6	3.5
Aug.	944,041	844,187	78.5	6.3
Sept.	23,949,000	22,100,000	74.7	9.9
Oct.	7,095,000,000	10,900,000,000	81.2	19.1

Note.—The column headed "Nominal Wages" shows the average nominal monthly wages of the miner (underground worker), from January, 1920, to November, 1922, the figures are those given by the officials of the mine; from December, 1922, onwards they are derived from collected agreements (they include supplementary allowances for a wife and two children, but not the value of the free coal supplied to miners). The index-numbers of real wages have been calculated on the basis of the index-number of the period in which the wages were spent (from the 5th of one month to the 7th of the next, and from September, 1923, onwards the method of payment has been taken into account). The figures relating to unemployment do not include those on short time. The data of the tables are taken from the official publications.

TABLE II.

* *Average Nominal Wage-rates per hour (pfennige), 1924-28.*

	Unskilled Workers.					Skilled Workers.				
	1924.	1925.	1926.	1927.	1928.	1924.	1925.	1926.	1927.	1928.
Jan.	44.2	54.9	65.1	66.0	73.7	58.1	77.8	92.5	93.2	101.0
Feb.	43.3	55.5	65.2	66.1	73.9	58.1	78.6	92.6	93.3	101.3
Mar.	42.4	56.8	65.2	66.7	74.1	58.6	80.5	92.6	94.3	101.5
Apr.	44.8	58.3	65.2	69.1	75.5	63.8	82.9	92.6	96.6	103.1
May	48.0	59.5	65.2	71.5	77.4	68.1	85.0	92.6	98.6	105.9
June	50.2	60.6	65.0	71.7	77.6	70.1	86.3	92.4	98.9	106.1
July	50.1	62.0	65.0	71.7	77.6	71.5	88.2	92.4	98.9	106.2
Aug.	50.4	62.9	65.0	71.7	78.3	71.0	89.3	93.4	98.9	106.3
Sept.	50.5	63.5	65.6	71.9	79.7	72.0	90.3	93.2	99.1	106.7
Oct.	51.4	63.7	65.7	72.6	80.4	73.1	90.7	93.1	99.8	107.5
Nov.	52.9	64.9	65.7	72.8	80.4	74.8	92.4	93.1	101.1	107.6
Dec.	54.2	65.1	66.0	72.9	80.9	77.0	92.4	93.2	100.3	107.8

* From *Wirtschaft und Statistik*, 1924-28.

TABLE III.

* *Index-numbers of Cost of Living, 1924-28.*

(1913-14 = 100.)

	1924.	1925.	1926.	1927.	1928.
Jan.	125.9	135.6	139.3	144.6	150.8
Feb.	119.9	135.6	138.8	145.4	150.6
Mar.	121.0	136.0	138.3	144.9	150.6
Apr.	125.3	136.7	139.6	146.4	150.7
May	126.9	135.5	139.9	146.5	150.6
June	123.5	138.3	140.5	147.7	151.4
July	126.4	143.3	142.4	150.0	152.6
Aug.	126.7	145.0	142.5	146.6	153.5
Sept.	129.4	144.9	142.0	147.1	152.3
Oct.	134.9	143.5	142.2	150.2	152.1
Nov.	135.4	141.4	143.6	150.6	152.3
Dec.	135.4	141.2	144.3	151.3	152.7

* From *Wirtschaft und Statistik*, 1924-28.

TABLE IV.

* *Percentage of Members of Trades Unions wholly employed, 1924-28.*

	1924.	1925.	1926.	1927.	1928.
Jan.	66.3	90.8	70.3	81.9	88.0
Feb.	69.8	91.5	71.2	83.1	88.8
Mar.	80.7	93.0	71.8	87.5	90.0
Apr.	88.1	94.6	75.4	90.3	92.2
May	89.3	95.4	76.2	92.4	92.6
June	84.2	95.4	76.6	93.1	92.5
July	79.5	95.1	77.3	93.9	92.2
Aug.	79.5	94.3	79.0	94.4	91.9
Sept.	84.6	93.6	81.3	94.9	91.9
Oct.	88.6	91.2	83.2	95.1	91.2
Nov.	90.9	84.8	83.7	92.1	88.9
Dec.	90.4	74.6	81.4	86.4	81.5

* From the publications of the Institut für Konjunkturforschung. Part-time employment is expressed in terms of full employment.

TABLE V.

* *Index of Production, 1924-28.*

(1924-26 = 100.)

	1924.	1925.	1926.	1927.	1928.
Jan.	77.5	111.8	95.4	120.3	127.8
Feb.			95.3	122.0	120.2
Mar.			92.5	123.3	128.1
Apr.	86.1	109.9	89.9	122.3	124.6
May		106.7	90.9	124.3	121.5
June		104.7	93.4	121.0	118.8
July	86.1	103.5	94.5	121.0	117.5
Aug.		101.2	101.3	121.9	117.8
Sept.		105.2	106.2	126.9	117.6
Oct.	101.6	103.8	111.0	125.0	116.0
Nov.		106.8	118.7	129.3	95.5
Dec.		101.6	120.3	126.5	115.2

* From the publications of the Institut für Konjunkturforschung.

TABLE VI.

* *Index of the Volume of Transactions, 1924-28.*

		Millions of Rm.	1924-26 = 100.
1924.	1st quarter.....	15,121	62.3
	2nd "	16,892	69.6
	3rd "	19,265	79.4
	4th "	24,722	101.9
1925.	1st "	25,112	103.5
	2nd "	25,294	104.3
	3rd "	25,962	107.0
	4th "	29,202	120.4
1926.	1st "	23,990	98.9
	2nd "	26,758	110.3
	3rd "	27,973	115.3
	4th "	30,836	127.1
1927.	1st "	28,586	117.8
	2nd "	29,809	122.9
	3rd "	31,755	130.9
	4th "	34,819	143.5
1928.	1st "	32,190	132.7
	2nd "	32,408	133.6

* From the publications of the Institut für Konjunkturforschung.

TABLE VII.

* *Index-numbers of hourly Wage-rates corrected for Cost of Living and Unemployment (Unskilled Workers).*

(1924-26 = 100.)

	1924.	1925.	1926.	1927.	1928.
Jan.	68	99	100	109	120
Feb.	73	101	102	109	121
Mar.	78	104	103	113	122
Apr.	85	107	104	117	125
May	90	111	105	122	128
June	91	111	105	122	128
July	86	109	104	121	126
Aug.	87	108	105	124	126
Sept.	90	109	108	124	130
Oct.	91	109	110	126	131
Nov.	95	107	109	121	—
Dec.	98	101	108	117	—

* Calculated by the author. Unemployment pay is taken into account.

TABLE VIII.
* *Index of Consumption.*

(1924-26 = 100.)

1924.	1st quarter.....	76	1926.	1st quarter	101
	2nd „	80		2nd „	103
	3rd „	92		3rd „	114
	4th „	100		4th „	117
1925.	1st „	97	1927.	1st „	111
	2nd „	104		2nd „	116
	3rd „	118		3rd „	125
	4th „	102		4th „	126
			1928.	1st „	126
				2nd „	121

* Calculated by the author from official sources.

DISCUSSION ON PROFESSOR BRESCIANI-TURRONI'S PAPER.

MR. HILTON: It gives me great pleasure to propose the Vote of Thanks to Professor Bresciani-Turroni for having supplied this paper to the Statistical Society. I am fully in accord with all that the President has said about the paper and its author, and should like to include in our expression of gratitude the name of Mr. Gordon, for the admirable way in which he summarised the paper for our benefit.

I feel in regard to this paper—and I think many will feel the same—that we are dealing with documents that contain a mass of rather elaborate and intricate facts, and I wish we could have had longer in which to study them before beginning to discuss them. In the circumstances, and particularly in view of the fact that we have not the charts available—which charts are more necessary in the case of this paper than in most, for the complete study of the data—I propose to do no more than mention one or two minor points upon which I feel some provisional reservation, and then to refer as a matter for subsequent reflection on my own part and perhaps for discussion, to what seems to me to be one very interesting feature of the paper. As regards the minor matters, on p. 379 it is stated: “Figures of family budgets, in spite of their admitted defects, are useful in estimating the incomes of working-class families, since they have the merit of treating the family as an economic unit.” This tends to over-state the value such family budgets have been found to possess for the purpose of estimating incomes of working-class families. Reference is here made to a German enquiry which covered 1,500 families. The degree of difference between the composition of one family and another makes it necessary, if one were endeavouring to obtain a sample of working-class incomes by any kind of budget method, to use a very much larger sample than

that. I do not think that any results obtained from a budget enquiry on this small scale could have any value as giving even an impression of the average family income of the workers. Of course it does give some sort of indication of the distribution of expenditure, but that is another matter.

What strikes me as particularly interesting in the paper is the suggestion that begins to be made on p. 391, and is developed at several points later in the paper. On p. 391 we find the following statement: "Owing to these excessive fluctuations in wage-rates, the loss in economic welfare suffered by the working classes through the monetary depreciation was still greater than the difference between the real wage of the depreciation period and the pre-war wage. The effect of unemployment on the worker's total income must also be taken into consideration." Later in the same paragraph we find:—"Contrary to the experience of the preceding period from the end of 1922 onward, the monetary depreciation and the rise in prices were accompanied by an increase in unemployment, as shown in Diagram II (curve D). It may appear strange that one and the same cause, namely, currency depreciation, should be capable of producing such opposite effects." (That is to say, there was an increase in unemployment as the rise in prices continued.) "The apparent paradox is explained by the fact that currency depreciation creates a demand for labour when the rise in wages lags behind the rise in wholesale prices, but it has not that effect when wages have become so much more sensitive that they rise simultaneously with prices." Here what Professor Bresciani-Turroni has in his mind is that there is some causal relation between the level of real wages and the rate of unemployment. One might go so far as to say that in his view the improved standard of living produces an increase in unemployment, and that when the wage earners are willing to accept, or are compelled by circumstances to accept, a lower standard of living, employment improves and unemployment disappears. This is confirmed in the next paragraph:—"Broadly speaking, it is evident that unemployment tended to diminish in the periods which show a decreasing ratio between the index of nominal wages and that of prices, and to increase with the increase of that ratio."

This is entrenching on a subject of the utmost importance in any country, and particularly important to us in Great Britain. It is extraordinarily valuable for this reason, that it directs attention to this possibility of a causal relation between real wages and unemployment. We have the data for this country, and if I had had time I would have made a careful examination of the figures for Great Britain in order to see whether it were true that here a rise in the standard of living has been accompanied by increased unemployment and vice versa. Some figures that I have prepared this afternoon, but which I have not been able to complete, did appear at first blush to lend some support to a theory of that kind, but in other periods seemed to contradict it.

Surely what creates the demand for labour is not the acceptance

by the worker of the lower standard of living, but that the buyer finds that to-morrow the goods will be dearer and decides that he had better buy to-day. I would suggest that what is here suggested as a cause may be nothing more than an accompaniment to the effect.

We can very usefully pursue this point not only in regard to Germany—although Germany is a very good example. In the case of Germany, however, we must beware of the following :—In Table I. you will see in the column “Real Wages” and the column “Unemployment” that there would not appear to be a causal relation, but the last figure for 1923 shows unemployment at 19 per cent. It is suggested in the paper that the general rule that increasing currency means increased employment broke down at this stage. I would rather surmise that what happened was that the currency depreciation had ceased to operate along the ordinary lines; money, men, and markets being alike submerged in the general economic chaos.

That struck me as being the most important and interesting thing in the paper, and I should like to express the thanks of the Society to Professor Bresciani-Turroni for providing the Society with this stimulating paper, and to Mr. Gordon for having summed it up so excellently.

PROFESSOR GREENWOOD : Owing to the unfortunate absence of Mr. Ashley, I very imperfectly second the vote of thanks, and join most heartily with Mr. Hilton in expressing my high appreciation not only of the interest of the paper, but also of the very clear way in which the actual reader of the paper has summarised it. Unfortunately I have no expert knowledge of the economic problems which are touched upon in this paper; the only contribution that I can make to the discussion is to refer to what in a sense are minor points, which perhaps have interest as clothing the statistical data with humanity. My reference will be almost entirely confined to the Appendices, and I must say that if this paper has a fault, it is perhaps that some of the most interesting and significant information is contained in footnotes and appendices, and does not form part of the text of the paper—I refer to the earnings of Government Employees and professional workers. The table at the middle of p. 408, if it means exactly what it says—and upon that point I should require further information—contains matter for reflection. According to it, after 1st October, 1927—long after the stabilisation of the Renten-mark—the monthly salary of Government officials of the highest class is merely a trifle over 1000 marks (or a salary of £600 a year). If there has not been excluded from this tabulation some equivalent of our Civil Service bonus for cost of living, it is obvious that the level of income of equivalent officials is not very greatly more than 50 per cent. of the same class in this country. That raises the question as to the only point on which I have knowledge. It may be said “What about the actual difference in the standard of living?” My own knowledge is confined to a small town in the South of Germany which I have known intimately for more than twenty years, but I think

that others acquainted with Germany will bear me out in saying that before the war the standard of living of the professional classes in Germany did not differ very greatly from the standard of living in the corresponding class in this country. What has happened since the war and as the result of the financial collapse is perhaps not quite fully realised by the equivalent class in this country. I am speaking of the period of 1925, when I examined the subject specially, when the actual cost-of-living-indices published by the two Governments did not differ very much. I know that the indices were differently constructed, but the retail prices of commodities were not, I think, very different in this country and Germany.

In connection with the position of the professional middle class, a point to which I do not think enough attention has been devoted is that whereas we ourselves may be said in a sense to have lost somewhere about 40 per cent. of our pre-war savings by a change in value, the equivalent class in Germany lost 100 per cent. To take the case of, say, general practitioners of medicine in the two countries: the ordinary middle-class way of making provision for the future is to take out an insurance policy, and, if one is sufficiently prosperous, perhaps also to invest in the equivalent of consols. We know that the German equivalent of consols ceased to have any value, and so did insurance policies. I know of one case where the insurance benefit fell due and the widow of the assured, instead of receiving twenty thousand marks, received twenty marks, which was rather liberal treatment at that time.

The paragraph dealing with the earnings of doctors is slightly misleading. In point of fact, the ordinary middle-class medical practitioner depends, in Germany as much as in this country, upon health insurance practice; that is to say, that the earnings under the Health Insurance system, which form perhaps three-fifths of the earnings of general practitioners in this country, also form three or four-fifths of the earnings of medical practitioners in Germany. In 1925 the system was not comparable with the English system, because in Germany the payment was largely based on the work done, *i.e.* was per visit or consultation, but there are some Insurance Offices where the capitation method is adopted, and that was at the rate of six marks, whereas the English equivalent payment was about ten shillings. I ascertained by enquiry that a practitioner of medicine who earned a gross income of between nine hundred and a thousand English pounds would have been regarded as an insurance "lion," which means, I think, that the average gross income was not greatly more than 50 per cent. of the equivalent class in this country. The actual result is that, the level of prices being much the same there as here, there was a very great difference in the standard of living.

In considering the budgetary outgoings of the two countries a great difference in expenditure upon the necessities of life, food and education, would not, perhaps, be found, but all the difference comes in luxuries which our middle classes did not indulge in before the war; and it raises the interesting question as to whether the apparent prosperity of the middle classes in this country, as compared with

Germany, is a sign of good omen: whether this *luxus* consumption and the prosperity of luxury trades are good indices of *national* prosperity.

I have great pleasure in seconding the Vote of Thanks to the author and reader of the paper.

MR. F. S. FLINT said he was very grateful to Professor Bresciani-Turroni for the paper, which would be of great assistance to him in his work. It opened up a number of lines of enquiry which it would be interesting either to contravert or confirm. Although the author surrounded his case with all the necessary reservations, Mr. Flint would like to be allowed to state what seemed to him to be the broad results of looking at the German figures of wages and cost of living. What appeared to have happened was that in 1922-23, when the mark collapsed until finally one billion paper marks became equal to one gold mark, the real wage of the German worker seemed to have been somewhere in the region of 55-75 per cent. of the pre-war wage. When the mark was stabilised in December, 1923, wages immediately began to rise, and from thence onwards to January, 1929, the rise had been practically continuous. Although there had been a continuous rise in nominal wages, it did not amount to much to the worker, because the general level of real wages in Germany appeared to be a trifle less than the pre-war level for skilled workers, and a little more than the pre-war level for unskilled workers. Although that was what appeared to emerge from a consideration of the average collective agreement rates published by the Federal Statistical Office, there had been three recent investigations into the actual earnings of textile, wood, and chemical workers. The investigations were by no means complete surveys, because they were confined to a few selected workers. After making all the allowances and reservations, the Federal Statistical Office arrived at the conclusion that for the particular occupations surveyed there was on the whole an increase in real wages over the pre-war level of from 1 to 10 per cent., except in some occupations affected by unemployment. The reservations to those calculations were that they did not know exactly what the pre-war earnings were, and assessments had to be made. Generally, the position seemed to be that, on the whole, the German worker was either a little worse off or not much better off than he was before the war. His position had, however, been improved by social legislation.

MR. CONNOR drew attention to Table I on p. 410.

The object of the Table was to bring out in a general way the relation between the real wages of the German worker and the amount of employment available, and a general conclusion was drawn that if the worker succeeded in improving his wages he would sooner or later suffer a corresponding loss because he was going to have less employment—and vice versa. That statement might be perfectly true, but it was not fully supported by the figures given in the Table, with regard to which he felt a certain amount of scepticism.

Surely there must have been great difficulty in getting reliable

statistics of wholesale prices during the inflation period. No information was given as to the basis on which these figures were obtained, but there must have been a certain amount of guesswork. We were then invited to divide the figures of nominal wages—which, by the way, related only to the wages of miners—by the index number of prices and arrive at real wages. Wholesale prices only reflected to a very limited degree currency values, first because they did not include retailers' profits and second because they referred to commodities only, and did not represent changes in prices of services.

So far as the consumer was concerned, there was no doubt that these changes in the price of services were at least as important as the changes of the prices of commodities.

In 1922-23 the position became catastrophic. Assumptions were made in the paper as to the days and times at which the employee received and spent his wages, but supposing that these assumptions were reasonably correct, did the results give any real information about his real income? The value of one's income depended largely upon the fact that one could take time about spending the money. Under the conditions of 1923, immediately a man received his wages he rushed off to the nearest shop to get rid of them, and it often made a great difference to him whether he could spend his money at once or in a few hours' time. A man's command over the means of existence, measured in terms of real income, must have been considerably reduced, because he had to buy what he could find in the shops at once; he had to get rid of his money, and could not run the risk of its depreciating any further. For this reason Mr. Connor suggested that the figures in the fourth column of Table I, were not of any great value as representing the real wages of the worker in general, and that it was difficult from these figures as they stood to draw any definite conclusions between the movements in real wages and the movements in the unemployment figures.

MR. A. P. L. GORDON said that the point that struck him when he read the paper—perhaps rather ahead of many Fellows—was the same point which Mr. Hilton took up, the apparent paradox of currency depreciation causing at first a drop and subsequently a rise in unemployment, and its explanation by the fact that the depreciation created a demand for labour as long as the rising wages lagged behind the rising wholesale prices.

If he understood the author correctly, it amounted to a statement that by no amount of increasing the nominal wage would the effective income of the workers be increased; in fact it would not be altered except in so far as friction always caused slightly lower output of the machinery.

On looking at the figures in Table I it seemed to him *prima facie* extremely unlikely that a rise in real wages of from 74.7-81.2 per cent. would cause such a rise in unemployment as 9.9-19.1, and he had pointed out that any kind of argument based on anything in the nature of ordinary experience must have broken down there.

Although the argument which Professor Bresciani-Turroni

produced seemed over the greater part of the material to provide a strong justification for the labour legislation which had characterised Germany in recent years, Mr. Gordon wished that he had separated the economic from the social factor rather more definitely. If he understood the author aright, his argument was that in the first stage of the inflation, up to the middle of 1922, the rise in wages lagged behind the rise in prices, and in the latter period, owing to increased efficiency on the part of the Unions and Labour Organisations generally, this lag was eliminated. It was certainly a fact that these agreements reached their high point, as regards the number of workers covered, in the 1922-23 period. It seemed that it might be possible to separate the economic from the social factor as regards these unemployment figures.

On looking at Table I., p. 410, it would be seen that the nominal wages were not converted into real wages—as Mr. Connor had thought they were—by means of these wholesale prices. Quite a different index was used in this case. Unfortunately this was not tabulated, but Mr. Gordon had taken out the figures quarterly, working them backwards, and it struck him that in all probability if the wholesale prices were regarded, from the industrialists' point of view, as being indicative of industrial costs, and if the cost of living actually represented the variation for the working classes, then, when wholesale prices went up more than in proportion to the cost of living for the working classes, there was something which might—in the nature of things, and apart from what wages were actually doing—have a definite effect on unemployment.

Mr. Gordon took out the ratios over the period shown, and there was quite definitely a correlation between these and the unemployment figures. The ratio of the cost of living index to that of wholesale prices rose to a peak of 85.1 in the first quarter of 1921 and sank to 48.5 in the third quarter of 1922. What was significant was that here there was a turn back. The unemployment figures seemed to reach their peak earlier than this ratio. This tendency seemed to vanish towards the collapse of the currency in 1922-23. If this indicated anything, it rather reversed Professor Bresciani-Turroni's argument during this particular period; that was to say, whereas he made out a case for supposing the Labour organisations to have been stronger in the latter part of the period than in the former, this argument tended to show that they were stronger in the former part rather than the latter. This was reinforced by the very high real wages at the time when the discrepancy actually appeared. This, of course, was interesting, inasmuch as Professor Bresciani-Turroni had not attempted in the paper to isolate the two factors that were working. It seemed to Mr. Gordon to be thoroughly intelligible to suppose that, as the collapse continued, there would have been a very considerable diminution, not in the mass of the unit, but in the strength of its bargaining power. It was quite clear that there was some factor of that kind, and Mr. Gordon assumed that this was the social force which Professor Bresciani-Turroni seemed to indicate was the whole story.

HERR RÜTER thanked the President for allowing him to take part in the discussion; it would be understood that anything he might say must necessarily be of an absolutely personal character.

When he first read the paper he wondered why all this material had been compiled, and wondered what could be the use of it. As a German, the memory of that time came back to him as a dreadful nightmare. Thinking of that time of the collapse of the exchange, and of the first difficult years after the re-construction, of the effect on the moral and external circumstances of his people and his country, he had found it difficult to see the use of all these findings and results of Professor Bresciani-Turroni; he could only express the fervent hope that never again would any country pass through such an experience. From the discussion of the paper that evening, however, he saw that it was valuable to scrutinise the effects of such a great breakdown of a currency as the world had seen in regard to Germany.

Although he was no expert statistician, it had struck him that this question of correlation between real wages and unemployment was a weak spot in the paper, and therefore he had been interested to hear the different views of the gentlemen who spoke, and especially the view of Mr. Hilton. Professor Greenwood's opinion on the salaries of Civil Servants in Germany had also interested him, as he was a Civil Servant himself, and could feel himself what it meant.

One point which had not been mentioned in the paper or discussion was the fact that this state of things in Germany was due not only to financial influences, but also to internal politics, which played a very great part. External politics also had some influence, in so far as times arose when a certain pressure brought about such a depression of moral feeling that the whole standard of life of the people was influenced to a great extent.

It would be very interesting to see what the scientists would have to reply to the paper, and he would like to ask the President's permission to send a copy of the paper to the proper quarter in Germany, as it would interest the author of the paper as well as the Royal Statistical Society to know what that Department had to say.

Herr Rüter again expressed his thanks to the President for the invitation to take part in the discussion, and generally for the great kindness the Embassy always received from the Society when they needed its help.

MR. HUGH VIBART said he had been particularly interested in the remarks made in regard to the ratio between skilled and unskilled wages. This point had not been referred to very much, but it was suggested that it was typical of the inflation period. He could not quite understand why that should be so; it seemed to be merely typical of falling wages. Had not the very same narrowing in the margin between skilled and unskilled wages occurred recently when commodity prices were low or falling, particularly in industries whose wages were governed by sliding scales, where the lowest-paid workers had had their wages altered and adjusted by special allowances, whereas the upper workers had remained in the scale? Was not this

point rather important when trying to relate the level of wages and unemployment? The level of wages might alter, but without any effect on the wage bill or the competitive ability of the industry. It was difficult to show in figures the extent to which the skilled workers' money had been handed over to the unskilled workers. It was undoubtedly very large, and it was possible that the wages might have altered in Germany and elsewhere, whilst the capacity of the industry to provide employment might not have been affected.

HERR RUTER thought that as the number of unskilled workers was greater than the skilled workers, probably they would have the majority in their Unions, and thus pressed through their demands which the Unions would have to put forward

MR. HUGH VIBART did not agree that this was altogether the case

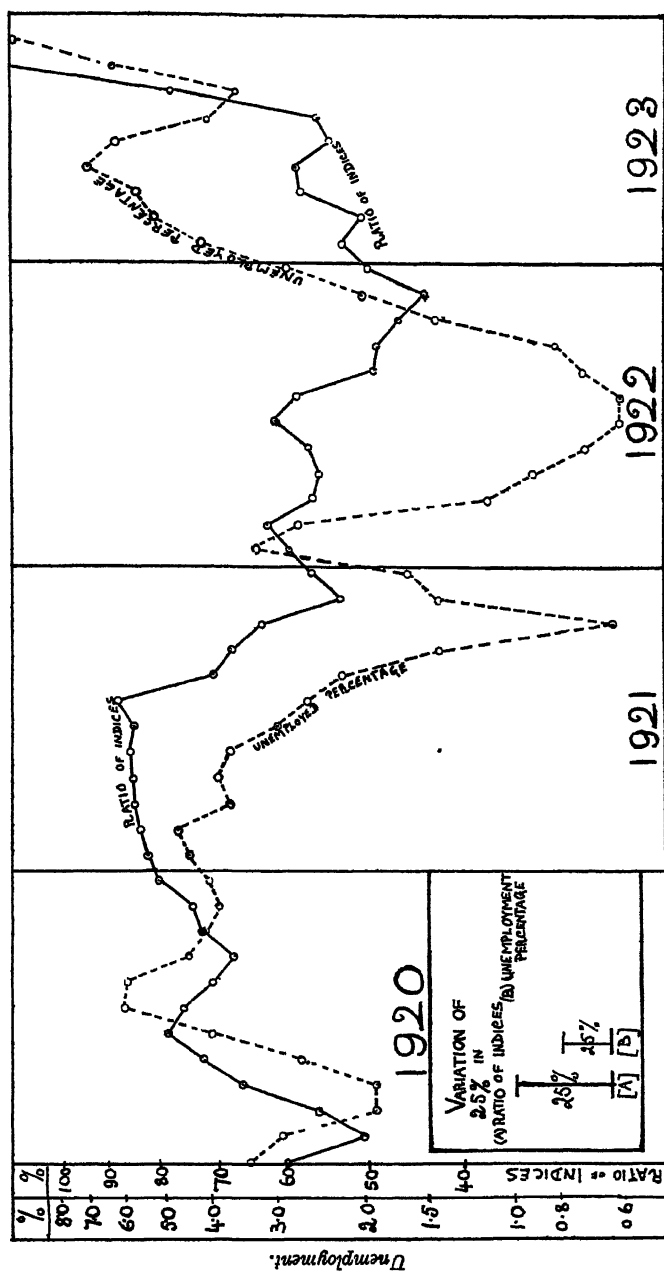
He noticed that in the Table given towards the end (p. 408), of salaried workers, it was apparent that the increase of nominal wages of married people was much greater than that of the single. It would be interesting to know whether there was a divergence between the wages of skilled and unskilled as between the single and married men, and what effect the family wage system had had in Germany. It had been said by a previous speaker that according to recent enquiry real wages in Germany were not very much higher, if at all higher, than before the war. It seemed rather hard to reconcile this with figures of the monthly earnings of £13 or £14 a month for a skilled craftsman worker—which figures had been reported to him from Germany a month or two ago. Apparently before the war skilled workers must have been getting more in Germany than in this country.

DR. ISSERLIS regretted that he had not been able to be present earlier, but he had been interested in reading the paper before the meeting. It appeared to be an attempt to solve a German problem from entirely German sources. Very frequently to solve what appeared to be an internal problem from entirely internal sources was not sufficient. He could only speak from a very narrow angle of the German position towards the end of 1923, but he was seriously concerned at that time in the fact that Great Britain was in certain respects losing her competitive ability as regards Germany in two matters—the question of shipbuilding and that of the loading and discharging of vessels. The difference in the external and the internal prices of commodities was a factor in unemployment. There was a correlation between unemployment in certain industries in this country and improved employment in Germany. This particular point deserved some attention.

THE PRESIDENT expressed his sense of the indebtedness of the Society to Professor Bresciani-Turroni for placing on record a mass of material dealing with events of extraordinary interest.

After the meeting MR. A. P. L. GORDON sent the following addition to his remarks on the paper:—

Since the Meeting at which Professor Bresciani-Turroni's paper



GERMANY, INFLATION PERIOD.—Ratio between Cost of Living and Wholesale Price Indices, compared with the Percentage Unemployed.

was discussed, I have worked out the full series of figures to which I referred at the time. The cost-of-living index was obtained from the Real and Nominal Wages given in Table I of the paper, and this was expressed as a percentage of the Wholesale Price Index. The figures are as follows:—

Cost of Living as Percentage of Wholesale Price Index.

	1920.	1921.	1922.	1923.
January	59.7	82.4	59.4	52.4
February	50.7	83.3	62.8	50.1
March	56.0	84.9	56.2	57.7
April	66.3	85.1	55.6	58.4
May	72.9	85.3	57.0	53.9
June	78.7	85.1	61.4	55.7
July	75.9	88.3	58.7	77.6
August	70.9	70.6	48.8	113.9
September	67.6	68.3	48.5	123.8
October	73.0	63.3	45.8	189.0
November	74.2	52.8	43.2	
December	80.6	56.4	49.3	

The graph on p. 423 shows the relation between this ratio and the Unemployed Percentage. It will be seen that there is a fairly close similarity between the two curves during 1920 and 1921, and again in 1923. In 1922 unemployment declined to a very low level, whereas the ratio of indices showed only a moderate decline, which set in after unemployment had reached its low point.

The correspondence between unemployment and the ratio of indices is a measure of the influence exerted upon the unemployment position by a purely economic factor. When the prices of those items which constitute the cost-of-living budget rise less than does the general price level, a given aggregate of commodities in the country's industrial budget can provide a greater number of livelihoods. In this case we may expect unemployment to decline.

The graph, it is submitted, demonstrates the nature of the economic influence acting over this period. It is, of course, clear that another factor was at work, and this may very well have been the social factor (*i.e.* the bargaining power of the labour unions) mentioned by Professor Bresciani-Turroni. The latter supposition is to some extent borne out by the fact that in 1922, when the correlation between unemployment and the ratio of indices appears to weaken, wages had a marked tendency to decline from the high levels of 1921.

PROFESSOR BRESCIANI-TURRONI writes:

I wish to express my warmest thanks to our President, to Mr. Hilton, and to the other Fellows who have been so kind as to manifest in a lenient way their opinion on my paper. I am greatly indebted to them for the many valuable suggestions they have given to me in the course of the discussion.

I beg to seize this opportunity to express also my profound

admiration for the great work done by English statisticians, to whom statistical science is indebted for most of the progress of these last few decades. In my course of lectures (a course on statistics is being given, in the English language, for the first time at the University of Cairo) I have adopted as a text-book Professor A. Bowley's well-known *Elements of Statistics*.

I shall begin with some minor points. As to the doubt expressed by Professor Greenwood as to whether the monthly salaries given in Appendix II include or not a bonus for cost of living, I shall answer that those figures represent the total salaries of State officials, and that there are no additional bonuses of any kind. In order to avoid misunderstandings as to the significance of the expression "officials of the highest class," I shall observe that this class includes the so-called "Ministerialräte," but not the "Ministerialdirektoren," who are the highest officials in a Ministry, and receive higher salaries than the Ministerialräte. I thank Professor Greenwood very much for the valuable additional information given in respect of the income of medical practitioners.

I agree with Mr. Vibart that the modification of the ratio between skilled and unskilled wages, to which allusion was made in the paper, is typical, not of inflation, but more generally of a period of falling wages. I may add in this connection that pre-war German statistics showed that the difference between the wages of skilled and of unskilled workers increased in the expansion phase of the business cycle, when there was a general increase of nominal wages; whereas that difference decreased during depression periods, together with the decrease of nominal wages. In both cases the variation of the difference was due to the fluctuations of skilled wages more than to those of unskilled wages.

In connection with the observations made by Mr. Connor, I regret that I did not explain more clearly how the indices of real wages were calculated. Nominal wages were converted into real wages not by means of wholesale prices, as Mr. Connor thought, but by means of the official indices of cost of living. The indices are given in the following table.

Indices of Cost of Living, 1920-1923.

(1913 = 1.)

	1920.	1921.	1922.	1923.
Jan.	—	11.8	20.4	1,120
Feb.	8.5	11.5	24.5	2,643
March	9.6	11.4	29.0	2,854
April	10.4	11.3	34.4	2,954
May	11.0	11.2	38.0	3,816
June	10.8	11.7	41.5	7,650
July	10.6	12.5	53.9	37,651
Aug.	10.2	13.3	77.6	586,045
Sept.	10.1	13.7	133.2	15,000,000
Oct.	10.7	15.0	220.7	3,660,000,000
Nov.	11.2	17.7	446.1	657,000,000,000
Dec.	11.6	19.3	685.1	1,247,000,000,000

Dr. Isserlis very rightly insisted upon the necessity of taking into account not only internal "sources," but also external ones; that is, the difference between the internal and the external prices of commodities. An enquiry into the correlation between the increase of employment in Germany and the decrease in other countries, and conversely, would have been indeed most attractive; but it would have exceeded the limits of the paper. Implicitly, the play of external influences is shown by the tables and the graphs, especially by Graph I. In Graph I, curve A (price of the dollar) may be considered as a rough index of the movement of external prices (expressed in marks), whereas curve C (cost of living) is an index of the movement of domestic prices. Graph I shows that whenever the gap between the two curves widened, unemployment decreased; whenever the gap narrowed, unemployment increased. When the purchasing power of the German mark decreased more slowly in respect of internal than of external prices, the foreign demand for German goods was stimulated; and conversely.

The point which seems to have attracted the attention of the Society, and more especially of Mr. Hilton and Mr. Gordon, is the relation between unemployment and real wages. When preparing my paper I was struck by the fact that during a certain period inflation seemed to have stimulated employment, whilst the contrary seemed to have happened in a succeeding period. Now, the demand for labour depends on the entrepreneurs' expectations of profit. As a rough measure of the variations of the gross income of entrepreneurs I took the movement of wholesale prices; and I considered nominal wages as a rough index of industrial costs. I found that in periods when nominal wages lagged behind wholesale prices, unemployment decreased, and that the conditions of the labour market became more unfavourable when nominal wages increased more rapidly than wholesale prices. Graph IV shows, I believe in a clear way, this correlation, which holds good throughout the entire inflation period. I have concluded that the influence of inflation on employment is different according as nominal wages lag, or not, behind prices. I am well aware of the limited importance of these results; in order that they may allow of more general conclusions as to the relations between real wages and unemployment they ought to be confirmed by further enquiries concerning other categories of workers (I have taken into consideration only miners' wages), and other countries too.

Mr. Hilton observes in this connection that "what creates the demand for labour is not the acceptance by the workers of the lower standard of living, but that the buyer finds that to-morrow the goods will be dearer and decides that he had better buy to-day." Surely, I do not deny the influence of internal, and also of external, demand. But for a while, that is, until production is increased owing to the additional workers, the flow of commodities remains as it was before; and therefore these additional workers could not be fed unless there were a diminution of the general real wage rates. In other words, if nominal wages lag behind prices, the workers

already at work must reduce their consumption, which permits more workers to be fed. The behaviour of workers and their being more or less aware of the effects of inflation seem therefore to me to be a fact of considerable importance.

Mr. Gordon (to whom I feel much indebted for having summarised my paper) approaches by a somewhat different way the problem I have dealt with. I have examined with great interest his graph, which shows a correlation between the amount of employment and the ratio of indices of two sets of prices (wholesale prices and cost of living). When preparing this reply, I happened to find that some time ago the Central Statistical Office of France had also made an enquiry, using French statistics, into the relation between employment and the ratio of the two indices. The results are in agreement with Mr. Gordon's conclusions. (*Bulletin de la Statistique générale de la France et du Service d'observation des Prix*, Oct.-Dec., 1927; also Dr. Woytinsky in *Weltwirtschaftl. Archiv*, July, 1928.) But the French Statistical Office attributed to each of the two indices a significance which differs from Mr. Gordon's interpretation. According to the same Office, the index of wholesale prices shows what prices the producers get for their goods, whereas the index of cost of living may be considered as indicative of the variations in wages. Thus, the point of view of the French Statistical Office is the same as that which I have taken; but I am of opinion that it is more exact to compare with wholesale prices not the index of cost of living, but that of nominal wages (which is perhaps lacking in France).

As to the interpretation given by Mr. Gordon I feel somewhat perplexed; however, he concludes that in the periods when cost of living (and therefore the level of wages) increase less than wholesale prices, "a given aggregate of commodities in the country's industrial budget can provide a greater number of livelihoods"; and this seems to agree with my conclusion, that "owing to the depreciation of the mark and the consequent decrease in real wage rates, the flow of commodities which maintained a given number of workers before the inflation could now provide the wages of a greater number."

Finally, I should like to express my best thanks to our Assistant Secretary for having translated in an admirable way my paper from the Italian manuscript.

As a result of the ballot taken during the meeting, the candidates named below were elected Fellows of the Society :—

Sydney Cressey.
Thomas Denman.
Fred Denis Fowler.

Angus Leith Macmillan, M.A., LL.B.
Harold Henry Warwick.

Corporate Representatives.

Charles Francis Atkinson, *representing* The British Broadcasting Association.
J. R. Coldlough, B.Sc., *representing* The Roads Improvement Association (Incorporated).
Arthur Reginald Lester, *representing* The New Zealand Refrigerating Company, Limited.

MISCELLANEA

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NEW ZEALAND—INFANT MORTALITY RATES AND STILL-BIRTHS.

By MALCOLM FRASER, O.B.E., Government Statistician, Wellington, New Zealand.

I. Introductory.

ON the 17th April, 1928, a paper was read before the Royal Statistical Society, by Major P. Granville Edge, O.B.E., dealing with Vital Registration in Europe. It was a most useful and informative paper, in the course of which special reference was made to the differences in practice and procedure in the registration of Births and Still-Births. In the following remarks I wish to direct attention to the effect of these differences on the comparability of infant mortality rates, and in particular to the need for uniformity of treatment and some further classification in these statistics than merely the distinction between live and still births, as illustrated by the New Zealand experience. In New Zealand since 1st March, 1913, the law has required the registration of still-births, and we now have an accurate count of the number of still-births for a period of fourteen years.

II. Definitions and Computation of Rates.

From the Annual Report of the International Institute of Statistics, where still-birth rates per 1,000 births are given, with definition of still-births followed in each case, it is clear that a very wide disparity exists as to the treatment of still-births. In most countries a still-born child is taken to mean one born after the 28th week of pregnancy and not alive at time of issue. In some countries, however (Belgium and until recently Holland and France), a child is counted as still-born if it dies before registration, which

may mean within three days of birth. In New Zealand the definition followed is:—

“A still-born child is one which has issued from its mother after the expiration of the 28th week of pregnancy and which was not alive at the time of such issue.”

As is well known, infant mortality rates are computed by taking the number of registered deaths of infants under one year of age per 1,000 registered births in the same year. This, of course, is not strictly correct, since a number of the deaths will have occurred among the births of the previous year—while some of those born will be in the deaths of the following year. Since, however, these errors tend on the whole to counterbalance one another, the result is approximately correct, and in any case it is the uniformly accepted practice. Still-births are neither included as births nor as deaths, but kept entirely separate. In view, therefore, of the difference in practice referred to, what is counted as a still-birth in one country is counted as a live birth and a death in another country. Consequently the comparability of infant mortality rates as between the various countries is greatly affected by the definition of still-birth adopted. For instance, if in New Zealand, as in France, Holland and Belgium, the deaths of infants occurring within two days of birth were to be treated as still-births and excluded from the computation of the infant death rates, the New Zealand rates for the past six years would be very considerably affected, as will be seen from the following table:—

Year.	Deaths under 1 year per 1,000 births.	Deaths under 1 year per 1,000 births, excluding births of infants dying within 2 days.
1922	41.89	29.61
1923	43.80	31.82
1924	40.23	29.32
1925	39.96	28.43
1926	39.76	27.98
1927	38.74	27.40
Average of quinquennium	40.50	28.99

III. *Still-Births and Neo-Natal Deaths.*

These figures indicate how closely the neo-natal deaths and still-births are related and how the definition and classification of the latter affect Infant Mortality rates. But, as will be seen later, premature birth, which is the principal cause of the deaths occurring

in the first two days, is also the cause of death at other periods of the first year of life. In the 2nd, 3rd and 4th week over 30 per cent. of the deaths are classed as due to premature birth. At present an infant born alive at $7\frac{1}{2}$ months and dying, say, within two weeks after birth is counted as a birth and a death, but an infant still-born at $8\frac{1}{2}$ months is not included either as a birth or death. Thus from a little consideration of these facts it will be obvious that the line of demarcation between still-births and infant deaths is not satisfactorily defined by the point of time of birth. Account should be taken of the intra-uterine age of the foetus. The object of this paper is to draw attention to this point, and to suggest that if the true incidence of infant mortality rates is to be obtained, either still-births should be included in the computation of the mortality rates, or note should be taken of the intra-uterine age and two classifications made. All full-time live births to be included in the computation of infant mortality rates, and all births of infants born prematurely to be classified separately, with still-births, separate mortality rates being computed for this class.

IV. *Infant Mortality Rates, 1880-1927.*

In the first column of Table I attached I have shown the New Zealand Infant Mortality rates from 1880 to 1927, and it will be seen at once that there has been a steady and satisfactory decline, particularly during the last twenty-five or thirty years. The second and third columns analyse the first column into two periods—(a) deaths of infants during the first month, and (b) deaths of infants between one month and twelve months. These clearly show that practically all the improvement has been effected in regard to infants over 1 month and under 12 months, while the rates for deaths under 1 month have been little affected, having remained fairly constant over the whole period since 1880. True, a slight improvement in the latter is shown for the last few years of the period, mainly due, I believe, to the increased attention directed to the pre-birth care of the mother—Karitane Hospital work, etc.

V. *Still-Birth Rates—1913-27.*

Now it is only since March, 1913, that the law in New Zealand has required the registration of still-births, and consequently we have a record of them only since that year. Column 5 of the table shows the rates for still-births, per 1,000 live and still-births, from 1914 onwards. It will be noted they have shown a considerable and steady increase, the rates for 1927 being 30.47 per cent. higher than those for 1914. The fact that still-births appear to be on the

increase is something to give rise to serious thought. In looking round for some explanation of the increase shown, two causes may be mentioned as contributing thereto: (1) the increase over a long period, coincident with a declining birth-rate, in the proportion of first births in the total births. It is well recognized that the percentage of still-births among first births is greater than among subsequent births. In New Zealand for the years 1923-27 the percentage of still to living births was 4.12 for first births as against 3.10 for all births. The percentage for the first six in order of nativity are as follows:—First, 4.12; second, 2.00; third, 2.17; fourth, 2.74; fifth, 3.34; sixth, 3.64. (2) The increased attention given to the pre-birth care of the mother, previously referred to. It has been found that over a large number of cases treated at our St. Helen's State Maternity Hospitals during the last few years, a considerable number of conceptions which previously would have resulted in miscarriage have been, with the earlier care and treatment now afforded, carried longer and have resulted in a still-birth.

There are no doubt also other causes affecting the matter, but which it is unnecessary to refer to here.

VI. *Infant Mortality Rates if Still-Births Included.*

Were still-births included in the computation of infant mortality rates, the position would be very considerably affected, as shown by the rates given in Column 4 of Table I. The rate for 1914 would be 73.58 instead of 51.38, and for 1927 it would be 68.08 instead of 38.74. Instead of showing a reduction from 1914 to 1927 of 24.60 per cent., the reduction would be only 7.47 per cent. If the rates for deaths under 1 month, as shown in Column 6 of Table I, are taken, the effect, of course, is still more striking. Instead of a rate of 28.87 in 1914 we have a rate of 51.59; and in 1927 we get 55.57 instead of 25.83; thus instead of showing a decline of 10.53 per cent. we should show an increase of 7.71 per cent.

VII. *Infant Deaths by Age Periods.*

In Table II I have given for the years 1920 to 1927 inclusive the infant mortality rates per 1,000 live births for (a) under 1 day, (b) 1 day and under 2 days, (c) 2 days and under 1 week, (d) total under 1 week, (e) 1 week and under 2 weeks, (f) 2 weeks and under 3, (g) 3 weeks and under 1 month, (h) total under 1 month, (i) total under 1 year, with a column showing the still-birth rates computed on live births for the same period. This table is included in order to emphasize more strongly the importance of the total number of still-births in relation to the total infant deaths; 31.49 in 1927 as against

38-74, and particularly the importance and influence of the deaths in the earlier periods (neo-natal deaths) upon the infant mortality rates.

VIII. *Infant Deaths by Causes.*

The close relationship between infant deaths and still-births can be further illustrated by a study of the causes of infant deaths. Table III shows the rates per 1,000 live births for the quinquennium ending on each year of the period 1880-1927, for eight groups of causes and for the total. An examination of these groups discloses the fact that they fall roughly into two classes. One class includes diseases which normally attack the infant after birth. The other class, containing the two groups headed "early infancy" and "malformations," includes causes all of pre-natal origin. As will be seen from a study of the table, all the improvement in infant mortality rates has been effected by reduction in the deaths from the diseases included in the first class; while deaths from those of the second class have actually shown a tendency to increase. Obviously the treatment of the child after birth will have little or no effect on causes which have their origin before birth. Indeed the reduction of the deaths from those causes which attack the child after birth will tend to make the deaths from prenatal causes, as well as still-births, loom larger in proportion to the total deaths.

IX. *Causes by Age Periods.*

Table IV gives the numbers of deaths, during the period 1920-27, from each of the principal diseases included in these groups, according to age periods under 1 year. It is at once seen that pre-natal causes are the only really serious factors in the deaths occurring during the first week.

Table V merely gives the same results as Table IV, but expressed as proportions per cent. of total deaths for these causes for each age period, and serves to emphasize still further how heavily these pre-natal causes count in the first month of life. It is seen that "early infancy" and "malformations" are the cause of 97.04 per cent. of the deaths occurring in the first day; of 91.88 per cent. of the deaths during the first week, and 87.28 per cent. of the deaths in the first month. Further, it will be observed from these tables that "premature birth," which must, I think, be held to be almost identical with "still-birth," accounts for no fewer than 64.23 per cent. of the deaths in the first day; 49.66 per cent. of the deaths in the first week, and 45.17 per cent. of the deaths in the first month. I submit that the figures given clearly demonstrate the importance and the tremendous influence of these early period deaths on our

infantile death-rates, and the close association between them and the still-births.

The importance of the early periods will be further apparent when it is noted that of the total deaths under 1 year—during the last seven years—63·98 per cent. occur in the first month; 48·02 per cent. in the first week; 28·62 per cent. in the first two days; and 19·66 per cent. in the first day. Equally striking are the percentages of the first-month deaths. The percentage of those dying in the first week during the last seven years being :—

					%.
1921	...	...	...	...	75·46
1922	...	...	...	...	74·94
1923	...	...	...	...	71·15
1924	...	...	...	...	78·24
1925	...	...	...	...	76·75
1926	...	...	...	...	80·41
1927	...	...	...	...	75·00

Similarly, if we go still further and analyse the first week we find the following percentages dying in the first day :—

					%.
1921	...	...	...	...	39·18
1922	...	...	...	...	42·90
1923	...	...	...	...	40·90
1924	...	...	...	...	42·09
1925	...	...	...	...	41·15
1926	...	...	...	...	41·85
1927	...	...	...	...	41·48

It will be further observed that, as in the case of still-births, all these percentages at the lower periods have been steadily increasing. At the older periods we are seeing in increasing numbers, and consequently increasing the proportion dying in the earlier periods; thus further clearly and definitely relating the problem of preventing these infant deaths to the consideration of pre-natal causes. It may be pertinent to the consideration of this subject to mention that while illegitimate births form 4·68 per cent. of the Total Births, 5·28 per cent. of the still-births and 6·94 per cent. of the infant deaths are those of illegitimate infants.

X. Suggestions for Improving Statistics.

The foregoing study of the position as regards the New Zealand Infant Mortality rates and still-births is submitted in order to

emphasise the present unsatisfactory character of computing infant mortality rates. It is clear that for the information of Health Authorities and those persons engaged in infant welfare work, under the present method of computing and tabulating these statistics the true effect of their work is obscured by the inclusion of deaths of infants (mainly premature births) whose chances at birth of living beyond a very brief time were extremely small, and who could not in any way be regarded as exposed only to normal risks of life. Also it is clear that the different practices which obtain in the various countries as to the treatment of what are counted as still-births and live births very greatly affect the comparability of these statistics as between country and country, so much so as in some cases to destroy it altogether.

I suggest that efforts should be initiated towards requiring—

(1) All reports of still-births for registration purposes to include certificates from medical practitioners stating, as far as it is possible to do so, the cause of death and the intra-uterine age of the foetus.

(2) That all certificates of deaths of infants under twelve months should similarly show the intra-uterine age at birth.

(3) That every endeavour should be made to have a uniform definition of still-births adopted, so that the classification and treatment thereof in all countries should be on a comparable basis.

When the particulars in (1) and (2) are obtained, the statistics for infant mortality rates should, in addition to the continuation of the present practice, include, for a time at any rate, tables showing rates by causes of death for all infant deaths and still-births classified in two or three groups according to intra-uterine age. The statistics would then be informative and helpful in reflecting accurately the results of all efforts having for their objective the safeguarding and strengthening of infant life against those diseases to which the child is exposed after birth; they would also throw light upon and indicate lines of action for combating those diseases or causes responsible for still-births or infant deaths of pre-natal origin or operation.

The following tables are appended :—

I. Table showing rates per 1,000 births of deaths of infants under 1 year, 1-12 months, under 1 month, under 1 year and still-births, still-births and under 1 month together with still-births, for the years 1880-1927.

II. Table showing rates per 1,000 live births for (1) Still-births, and (2) Infant deaths classified according to certain age divisions of the first year of life.

III. Table showing rates for the principal causes of death per 1,000 live births for each quinquennium ending on the year stated for the period 1880-1927.

IV. Table showing numbers of deaths of infants from certain specified causes during the period 1920-27 at certain divisions of the first year of life.

V. Table showing for the period 1920-27 the percentage of the total infant deaths of deaths of infants at certain divisions of the first year of life from certain principal causes.

Graphs illustrating Tables I, II, III and V are also appended, and from a study of these the points discussed will be much more readily apprehended than from consideration of the tables themselves.

TABLE I.

NEW ZEALAND—INFANT MORTALITY 1880-1927.

Table showing rates per 1,000 births of deaths of infants under 1 year, 1-12 months, under 1 month, under 1 year and still-births, still-births and under 1 month together with still-births, for the years 1880-1927.

Year.	Deaths of Infants under 1 year per 1,000 Live Births.	Deaths of Infants 1-12 months per 1,000 births less deaths under 1 month.	Deaths of Infants under 1 month per 1,000 Live Births.	Deaths of Infants under 1 year and Still-Births per 1,000 Total Births (incl. S.B.).	Still-Births per 1,000 Total Births (incl. S.B.).	Deaths of Infants under 1 month together with Still-Births per 1,000 Total Births (incl. S.B.).
1880	93.33	67.53	27.66	—	—	—
1881	92.41	65.26	29.04	—	—	—
1882	88.27	59.84	30.25	—	—	—
1883	103.90	75.79	30.41	—	—	—
1884	79.26	51.84	28.92	—	—	—
1885	89.17	60.79	30.21	—	—	—
1886	98.40	71.75	28.71	—	—	—
1887	93.81	67.54	28.17	—	—	—
1888	70.68	46.93	24.92	—	—	—
1889	78.89	52.44	28.44	—	—	—
1890	78.67	51.97	27.63	—	—	—
1891	91.23	63.12	30.32	—	—	—
1892	89.17	60.09	30.94	—	—	—
1893	87.97	60.09	29.36	—	—	—
1894	81.34	52.86	30.06	—	—	—
1895	88.27	58.47	31.00	—	—	—
1896	77.32	48.38	30.41	—	—	—
1897	72.26	46.20	27.33	—	—	—
1898	79.66	50.97	30.23	—	—	—
1899	95.89	65.16	32.86	—	—	—
1900	75.16	45.51	31.05	—	—	—
1901	71.40	42.91	29.77	—	—	—
1902	82.89	52.38	32.20	—	—	—
1903	81.03	51.00	31.70	—	—	—
1904	70.98	42.86	29.39	—	—	—
1905	67.52	38.53	30.15	—	—	—
1906	62.10	33.52	29.56	—	—	—
1907	88.79	60.21	30.41	—	—	—
1908	67.89	37.80	31.23	—	—	—
1909	61.60	32.65	29.94	—	—	—
1910	67.73	38.65	30.25	—	—	—
1911	56.31	28.63	28.50	—	—	—
1912	51.22	21.81	30.06	—	—	—
1913	59.17	30.36	29.71	—	—	—
1914	51.38	23.18	28.87	73.58	23.40	51.59
1915	50.05	21.42	29.26	74.23	25.47	53.99
1916	50.70	24.37	27.01	72.90	23.36	49.74
1917	48.16	20.87	27.87	70.99	23.99	51.19
1918	48.41	22.29	26.72	73.53	26.39	52.41
1919	45.26	17.36	28.39	71.06	27.02	54.64
1920	50.57	20.38	30.81	76.49	27.31	57.28
1921	47.82	17.70	30.66	76.99	30.64	60.37
1922	41.89	15.06	27.24	68.92	28.21	54.68
1923	43.80	15.25	29.07	73.42	30.98	50.15
1924	40.23	16.68	23.95	68.65	29.62	52.86
1925	39.96	13.90	26.43	68.45	29.68	55.32
1926	39.76	14.67	25.46	68.74	30.18	54.87
1927	38.74	13.25	25.83	68.08	30.53	55.57

NEW ZEALAND INFANTILE MORTALITY

Death Rates exclusive of Stillbirths per

thousand Live Births 1880-1927, and

Death Rates inclusive of Stillbirths per thousand

Births (inclusive of Stillbirths)

1914-1927.

Table I

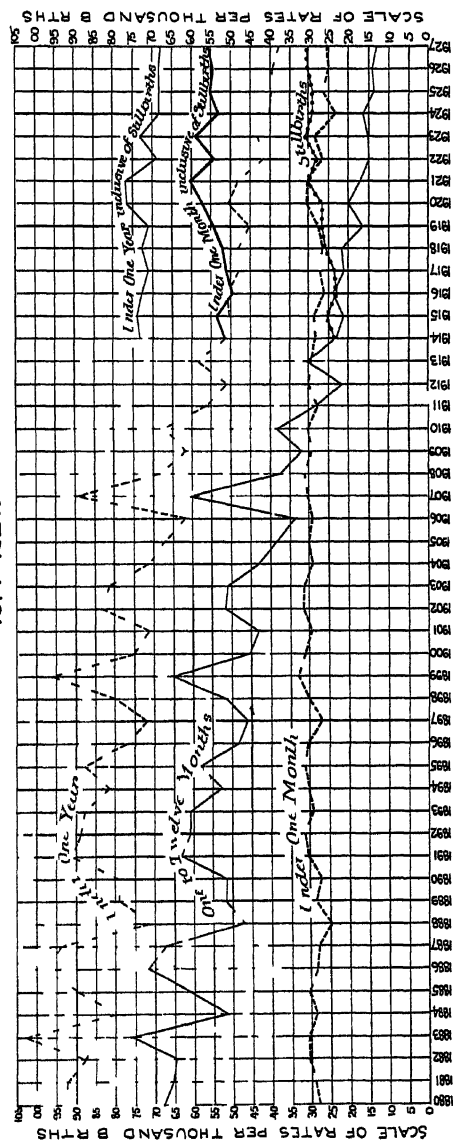


TABLE II.

NEW ZEALAND—STILL-BIRTHS AND INFANT MORTALITY, 1920-27.

Table showing rates per 1,000 live births for (1) Still-births and (2) Infant deaths classified according to certain age divisions of the first year of life.

Year.	Still-Births.	Under 1 day.	1 day and under 2 days.	2 days and under 1 week.	Total under 1 week.	1 week and under 2 weeks.	2 weeks and under 3 weeks.	3 weeks and under 1 month.	Total under 1 month.	Total under 1 year.
1920	28.07	8.36	13.33		21.69	3.94	2.81	2.37	30.81	50.57
1921	31.61	9.07	4.41	9.66	23.14	3.39	2.17	1.96	30.66	47.82
1922	29.03	8.76	3.89	7.76	20.41	3.48	2.14	1.21	27.24	41.89
1923	31.97	8.44	3.93	8.26	20.63	4.18	2.54	1.65	29.00	43.80
1924	30.52	7.89	3.35	7.50	18.74	2.25	1.68	1.28	23.95	40.23
1925	30.58	8.35	3.51	8.42	20.28	3.02	1.74	1.39	26.43	39.06
1926	31.12	8.57	3.54	8.36	20.47	2.11	1.65	1.23	25.46	39.76
1927	31.49	8.03	3.62	7.71	19.36	3.27	1.72	1.48	25.83	38.74

Table II

NEW ZEALAND INFANTILE MORTALITY AND STILLBIRTHS Per Thousand Live Births, 1920-1927.

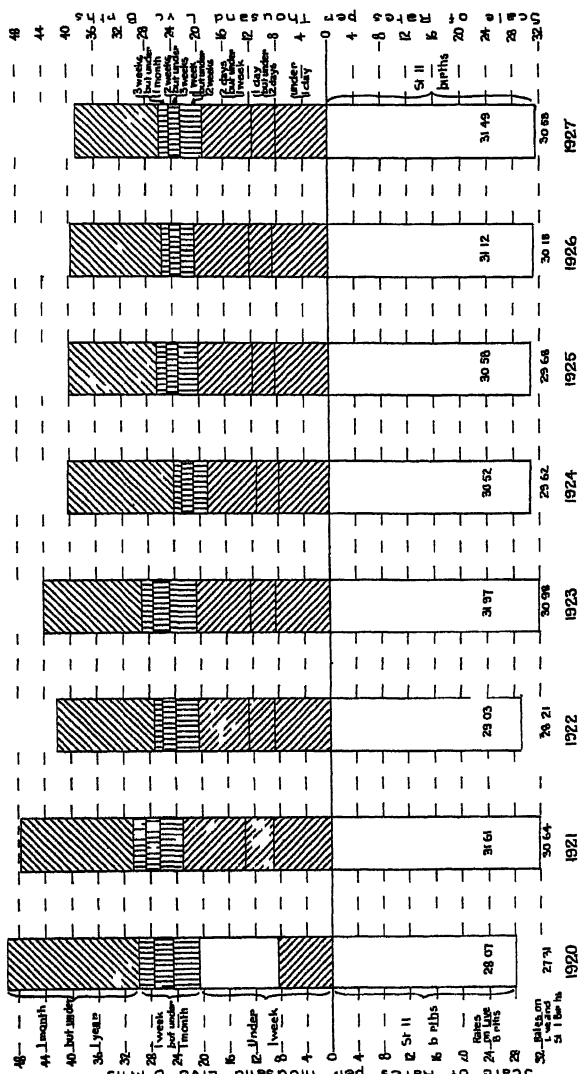


TABLE III.

NEW ZEALAND—INFANT MORTALITY 1880-1927.

Table showing rates for the principal causes of death per 1,000 live births for each quinquennium ending on the year stated for the period 1880-1927.

Year.	Epi- demic Dis- eases.	Tuber- culosis.	Infan- tile Convul- sions.	Respira- tory Dis- eases.	Gastric and In- testinal Diseases.	Mal- forma- tions.	Early Infancy.	Other Causes.	Total.
1880	8.3	5.3	7.6	11.7	21.1	1.6	22.6	17.6	95.8
1881	8.6	5.2	7.6	12.3	19.8	1.3	21.9	16.9	93.6
1882	8.3	5.1	7.8	12.6	19.1	1.3	22.6	16.4	93.2
1883	8.9	5.2	8.0	13.4	20.4	1.3	22.9	17.0	97.1
1884	7.9	5.0	8.0	12.2	18.1	1.4	23.1	15.7	91.4
1885	8.1	4.8	7.8	11.9	18.1	1.2	24.4	14.4	90.6
1886	8.1	4.8	7.6	11.2	19.2	1.2	25.3	13.5	90.9
1887	8.2	4.8	7.6	11.4	20.9	1.2	25.7	13.0	92.9
1888	7.1	4.6	7.1	10.8	18.3	1.2	25.6	11.5	86.3
1889	6.3	4.2	6.7	10.8	19.9	1.2	25.7	11.3	86.2
1890	6.5	3.9	6.6	10.3	19.7	1.3	25.1	10.7	84.1
1891	7.4	3.6	6.6	11.0	18.5	1.3	25.0	10.2	83.6
1892	7.3	3.3	6.2	10.7	18.0	1.2	25.0	10.1	81.7
1893	8.7	3.2	6.4	11.6	18.2	1.3	25.7	10.2	85.2
1894	10.1	3.3	6.4	11.3	17.0	1.2	25.0	11.4	85.7
1895	10.5	3.5	6.6	12.4	16.3	1.3	25.0	11.9	87.6
1896	8.7	3.3	6.6	11.0	16.6	1.4	25.0	12.3	84.8
1897	7.8	3.1	6.5	10.8	15.7	1.6	24.1	11.9	81.4
1898	6.1	3.0	6.2	9.5	17.0	1.5	24.6	11.9	79.8
1899	5.7	3.0	6.4	10.4	18.5	1.6	26.1	10.9	82.7
1900	5.0	2.7	6.0	9.0	18.7	1.5	25.7	11.4	80.1
1901	4.8	2.6	5.5	10.0	17.2	1.5	26.2	11.0	78.9
1902	5.4	2.4	5.2	10.5	17.3	1.5	27.9	10.8	81.0
1903	6.4	2.3	5.1	11.3	16.5	1.5	27.8	10.4	81.3
1904	5.2	1.8	4.5	10.0	16.0	1.6	27.0	10.2	76.3
1905	4.5	1.7	4.3	10.4	15.5	1.4	27.9	9.1	74.8
1906	4.4	1.5	4.1	9.7	15.3	1.3	27.6	9.0	72.9
1907	5.4	1.5	4.0	9.5	16.4	1.3	26.9	9.1	74.1
1908	3.9	1.4	3.6	8.4	16.9	1.3	26.8	9.1	71.5
1909	3.9	1.4	3.6	8.4	15.5	1.4	26.6	8.7	69.6
1910	4.5	1.5	3.4	7.8	15.7	1.7	26.8	8.3	69.6
1911	4.3	1.3	3.3	7.6	15.5	1.8	26.7	7.8	68.5
1912	2.2	1.2	3.1	6.4	12.6	2.4	26.5	6.6	60.9
1913	2.4	1.0	3.0	6.4	10.8	2.8	26.7	6.2	59.2
1914	2.4	0.9	2.5	5.9	10.0	3.0	27.0	5.4	57.2
1915	2.0	0.7	2.3	5.5	8.1	3.5	26.5	5.0	53.6
1916	2.4	0.6	2.2	5.1	7.4	3.9	26.2	4.6	52.5
1917	2.6	0.5	2.2	4.9	7.1	3.9	25.7	5.0	51.9
1918	2.8	0.5	2.1	4.5	5.9	3.9	25.5	4.5	49.8
1919	2.5	0.4	2.1	4.5	5.2	4.1	25.2	4.4	48.5
1920	2.6	0.4	2.0	4.5	5.0	4.1	25.7	4.3	48.6
1921	2.2	0.4	1.9	4.6	4.5	4.3	26.1	4.0	48.1
1922	2.1	0.4	1.8	4.5	3.9	4.4	26.1	3.5	46.8
1923	1.7	0.4	1.7	4.5	3.8	4.9	25.6	3.4	45.9
1924	1.9	0.4	1.5	4.5	3.8	4.9	24.6	3.3	44.9
1925	1.5	0.4	1.5	4.4	3.4	5.0	23.5	3.1	42.7
1926	1.9	0.4	1.3	4.4	2.8	4.8	22.6	2.9	41.1
1927	2.0	0.5	1.2	4.5	2.6	4.9	21.8	3.1	40.5

Note.—In the year 1923 and each subsequent year in the Statistics "Epidemic Diseases" includes "Infantile Paralysis" and "Meningococcus Meningitis," previously included in "Other Causes."

Table III

NEW ZEALAND INFANTILE MORTALITY
Rates for Principal Causes
for Quinquennia ending each year from
1880 to 1927.

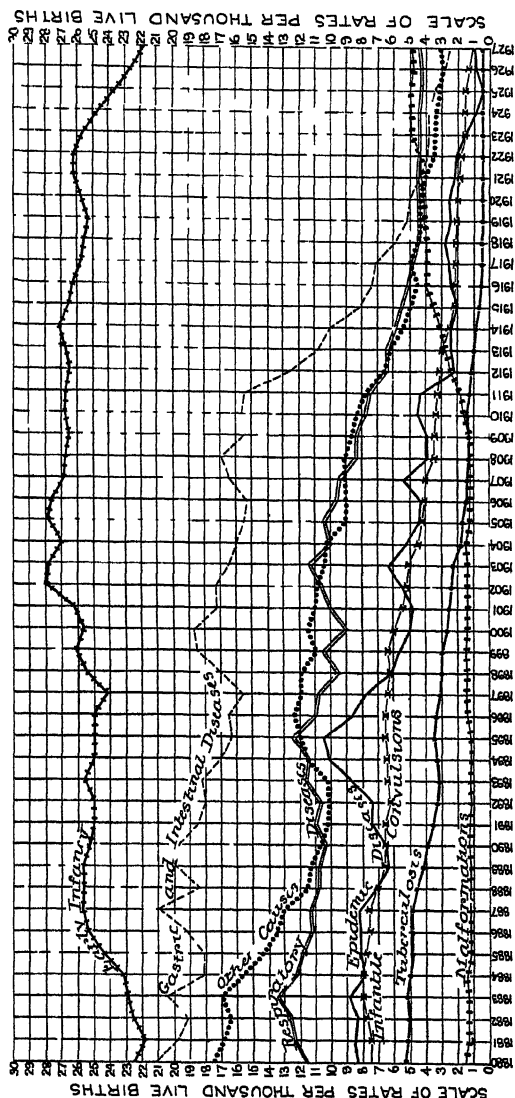


TABLE IV.

NEW ZEALAND—INFANT MORTALITY 1920-27.

Table showing numbers of deaths of infants from certain specified causes during the period 1920-27 at certain divisions of the first year of life.

Diseases.	Under 1 day.	1 day and under 1 week.	Total under 1 week.	1 week and under 1 month.	Total under 1 month.	1 month and under 1 year.	Total under 1 year.
<i>Early Infancy ;—</i>							
Premature Birth	1,235	1,098	2,333	494	2,827	174	3,001
Congenital Debility	180	394	574	283	857	381	1,238
Injury at Birth	83	160	243	35	278	7	285
Lack of Care	14	6	20	—	20	1	21
Other Diseases peculiar to early infancy	210	422	632	103	735	47	782
Total	1,722	2,080	3,802	915	4,717	610	5,327
Malformations	144	371	515	231	746	357	1,103
<i>Respiratory Diseases ;—</i>							
Bronchitis	1	9	10	25	35	165	200
Bronchopneumonia	1	12	13	66	79	491	570
Pneumonia	—	14	14	25	39	158	197
Other	4	21	25	9	34	32	66
Total	6	56	62	125	187	846	1,033
<i>Gastric and Intestinal Diseases ;—</i>							
Diarrhoea and Enteritis	1	2	3	69	72	493	565
Other	1	19	20	15	35	121	156
Total	2	21	23	84	107	614	721
<i>Epidemic Diseases ;—</i>							
Measles	—	1	1	3	4	45	49
Whooping-cough	—	—	—	5	5	232	237
Diphtheria	—	—	—	1	1	31	32
Influenza	—	3	3	11	14	59	73
Erysipelas	—	—	—	3	3	20	23
Infantile Paralysis	—	—	—	—	—	10	10
Other	—	2	2	1	3	13	16
Total	—	6	6	24	30	410	440
Infantile Convulsions ...	11	142	153	47	200	114	314
<i>Tuberculosis ;—</i>							
Tuberculous Meningitis	—	—	—	2	2	65	67
Other forms of Tuberculosis	—	—	—	—	—	31	31
Total	—	—	—	2	2	96	98
Other Diseases, etc.	38	99	137	133	270	477	747
Grand Total	1,023	2,775	4,698	1,561	6,259	3,524	9,783

TABLE V.

NEW ZEALAND—INFANT MORTALITY 1920-27.

Table showing for the period 1920-27 the percentages of the total infant deaths of deaths of Infants at certain divisions of the first year of life from certain principal causes.

[illegible]

the course of many contributions, that the second and third (properly interpreted in relation to the effects of constraints artificially introduced that limit variation) enable us to arrive at the distributions of such statistical constants * as intra-class correlations, correlation ratios, regression coefficients and multiple correlation coefficients (universe value zero).

The present contribution refers to the distribution ("A") of the multiple correlation coefficient R in samples of $n_1 + n_2 + 1$ (n_1 = number of independent variates x_1, x_2, \dots, x_{n_1}) from a universe in which the multiple correlation coefficient is ρ , and this is arrived at by linear transformations of the independent variates and use of the already discovered distribution of the simple coefficient of correlation r . The formula for the frequencies is turned from one in a double definite integral containing ρR into a hypergeometric series in powers of $\rho^2 R^2$, the series being limited in the case when n_2 is even and expressible in finite terms in the case when n_1 and n_2 are both odd; and elementary instances (small samples) are taken for both cases and the frequencies formulated.

As an example, if there are two independent variates and samples of 5 are drawn, the frequency of multiple R for true universe value ρ is,

$$(1 - \rho^2)^2 (1 + \rho^2 R^2) (1 - \rho^2 R^2)^3 dR^2.$$

The case of large samples is next taken and the frequency formulated ("B"), involving a bessel function with imaginary argument, and various interesting particular cases are deduced when the number of variates n_1 is 3, 5 and 7. The practical application of these cases will be appreciated, and Fisher suggests his useful transformation of the simple correlation coefficient,

$$z = \tanh^{-1} r,$$

suitably modified, as likely to replace skew by normal error in these distributions also. A table is given that will show, for given ρ , what R value will be exceeded once in twenty samples, for this class of cases.

For practical work it is not the ordinate but the area of the distribution of R that will be needed to assess significance, and Fisher is able to give a formula with again a hypergeometric series in $\rho^2 R^2$ (and further in $1/(1 - \rho^2 R^2)$) to show integral probabilities, and the formula is particularized.

Lastly, the distribution of R found for large samples (which was

* Latin *constans*, standing together (of the statistics). Those of us who think of statistics as the presented data are loth to make it singular, still more to use statistic with the meaning of constant.

derived in the first place from the known distribution of r) is shown to be derivable also by the first method, referred to above, that of variance, but with the modification that the deviates called y no longer have zero means. The other problems of distribution solved by variance usually regard the independent variates as without errors, and this condition is imposed to find a third distribution of R , ("C"), suitable for such assumption.

The paper is naturally hard reading, but one feels the driving force that attains ends, that appears to characterize all Dr. Fisher's work, and each paper seems to resolve some of the obscurities of the preceding papers.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*The Shadow of the World's Future, or the Earth's Population Possibilities and the Consequences of the Present Rate of Increase of the Earth's Inhabitants.* By Sir George Handley Knibbs, C.M.G., F.R.A.S. 131 pp. London: Ernest Benn, Ltd. 1928. Price 10s. 6d.

The distinguished author of this book has but lately left us. The last number of the *Journal* (p. 296) expresses the regret of us all. He belonged to us as well as to Australia.

The writing of such a study, however judged by critics, is a proof that great knowledge of statistical detail does not unfit a man for taking a wide view of his subject. Certainly a view must be wide indeed that embraces not only our whole earth but the whole history and the probable future of it.

It is not altogether a sanguine view. There was a total in 1928 of 1,950 millions of human beings on the earth (p. 11), increasing at the rate of nearly 1 per cent. per annum. The upper limit is given as 7,800 millions (p. 96). It is suggested that long before we reach that limit we shall not find it easy to provide for our numbers. On the other hand, the author himself points out that whether the rate is to go on or the provision to prove short depends on a multitude of considerations pro and con, given in ample fulness over his pages, without (it must be confessed) bringing home to the ordinary reader any kind of certainty, dark or bright. In truth we are confronted with all the elements of the problem without being conscious of approaching any solution; rather are we left to choose our own alternative.

His own chief fear seems to be that the present rate of increase is faster than the old, despite certain phenomena lately noted in civilised countries. As the matter is largely a question of tendencies, it must be remarked that we should not all agree about the tendencies

as here stated. Here is a questionable statement (p. 32, middle): "If the multitudes of the East should Westernize their conceptions as to what constitutes a reasonable standard, the population problem is at once raised to a plane of greater difficulty. On the other hand, if Western races ever abandon both their present love of what may seem to some inordinate luxury and all useless complication of the paraphernalia of social life, it is certain that the population difficulty for a time at least will diminish." It is not self-evident that a people adopting a lower standard of living will tend to grow more slowly than a people with a raised standard.

If that doctrine of our author's is baffling because it does not seem true, the following is so because not clearly expressed: "The population possibilities of the earth are such that the correctives of the present rates of use [of minerals] will come automatically" (p. 44). There is perhaps an even more dubious phrase on the first page: "Man's occupancy of the world's surface is not as informative as one might wish it to be." The context interprets this to mean that man does not always tell his own story and leave a record of it available somewhere. As a rule, however, there is no obscurity of style; the drawback is rather, for ordinary readers, even when Fellows of our Society, that the author has attempted too much. He has tried to cover in one flight what the American book, *Population Problems of the U.S. and Canada* (ed. Louis J. Dublin, 1926), seeks to overtake in a long series of essays written by different men from different points of view and with a different experience of life behind them. As it is, the two books, the American and his, produce the same impression of multiplicity and complexity never finally reduced to coherence. Yet many details are presented more tersely and clearly by our author than in the American book, say in his Chap. III, Man's Agricultural, Forestal, and Animal Needs.

He magnifies the importance of the subject; it is to him "the problem of problems" (p. 119). He has not discovered any new unfavourable symptoms. The power to destroy life has increased more rapidly than the power to sustain it (p. 84); this has been long known. Even the evils of Bolshevism (p. 88) are exaggerated; or twelve years of it would have destroyed the entire Russian nation. It is not a new discovery that the lordship of man in the earth is still questioned by a majority of the lower animals (p. 124).

There is to be a new burden laid on the sons of Adam: "A survey of the entire world to determine the population-carrying power of various countries has become a desideratum" (p. 91). Other duties seem to lie nearer to science than this. "The population question is not merely a mathematico-physical one," we are frankly told (p. 46). Our author (see pp. 48, 54, 57, and Chap. V.) can handle the mathematical side of his problem to admiration. But, in view of this last quoted statement, need we fear the shadow at all?

His closing words may be the answer. A little more wisdom on the earth (of which perhaps there are signs) "may lead mankind in the end to discover that their world has, like Chamisso's Peter Schlemihl, lost its shadow" (p. 128).

J. B.

2.—*Trade and Credit*. By R. G. Hawtrey. 189 pp. London : Longmans. 1928. Price 10s. 6d. net.

Mr. Hawtrey's official position gives him exceptional opportunities of observing our monetary system at work, and his writings are always novel and stimulating. His first three essays are concerned with the machinery of credit in relation to trade, whilst the remaining five deal with the relation of credit to productive activity and more particularly to the trade cycle. In the case of the latter he expounds and defends the statement made in his *Monetary Reconstruction* that the trade cycle is a "purely monetary phenomenon."

The opening essay on "Currency and Public Administration," which deals with central banking, argues that the system possesses an inherent tendency towards inflation. "The money market needs a regulator to prevent the fabrication of a redundant supply of the means of payment," and "whoever has control over credit does, in fact, determine the fluctuations of prices and the magnitude and frequency of the alternations of inflation and depression."

In "The Gold Standard and Balance of Payments" it is concluded that "a disturbance of the balance of payments arising from a change in the demand or supply of commodities, whether seasonal or other, is properly met by a suitable adjustment of credit," and that "the transmission of gold is only necessary in so far as the adjustment of credit does not exactly keep pace with this disturbance."

The fourth essay deals, under the title of "Inflationism," with the forgotten theories advanced by Thomas Attwood, the Birmingham banker, a century ago. "We may be quite certain," observes Mr. Hawtrey in a characteristic passage, "that in a recurrent and persistent controversy of this kind there is something to be said on both sides, and we shall find it easier to take a dispassionate view of it in one of its past manifestations than if we see it through the eyes of contemporary controversy. To understand is to forgive. A cynic might retort that to be intelligible is to be found out. Perhaps both sayings are partly true of inflationism." "The true solution of the problem," continues the author, "is to be found in the stabilization of prices." "The trade-cycle can be eliminated, or at any rate so reduced in extent as to avoid epidemics of unemployment, without any departure from the gold standard, provided the banking authorities of the different gold standard countries co-operate for that object."

An essay on the "Trade Cycle" emphasizes the instability of credit through the lack of any self-balancing principle and the helplessness of the business community in the face of stringent monetary conditions. "Without the creation of bank credit, or some process equivalent to it, the desire of traders to add to their stocks will not on balance occasion any activity in trade at all." "Trade depressions cannot be due to over-production . . . but to deficiency of demand."

In "Public Expenditure and the Demand for Labour" it is argued that public expenditure can only give additional employment

if it increases the rapidity of circulation of money. "Public works are merely a ritual, convenient to people who want to be able to say they are doing something, but otherwise irrelevant. . . . To resort for the purpose to the construction of expensive public works is to burn down the house for the sake of the roast pig." "The true remedy for unemployment is to be found in a direct regulation of credit on sound lines."

The concluding essay criticizes Professor Pigou's *Industrial Fluctuations* in detail. It is contended that "credit expansion results in increased output because it increases the supply of the means of payment and swells demand." "All causes of fluctuations in productive activity are conditioned by the monetary factor. Only those can bear fruit for which the monetary climate for the time being is favourable." Finally, it is contended that the dependence of industrial fluctuations on credit explains their world-wide character.

L. R. C.

3.—*Considerazioni sui "Barometri Economici."* By C. Bresciani-Turroni. 100 pp. Città di Castello: Soc. Tip. "Leonardo da Vinci." 1928.

Numerous experiments with economic barometers are being made at the present time by Universities, Government Statistical bureaux and private organizations; and while definite success in prediction is remote, interesting developments may be expected during the next few years. Briefly, the problems of the business forecaster involve the choice of appropriate series (or combinations of series) whose movements symptomize approaching economic changes, and the expression of their movements in terms of deviations from "normal." As the underlying factors exercise varying degrees of influence both during successive cycles and during successive phases of the same cycle, the solution is highly complicated and cannot yield to any purely mechanical interpretation. Comparisons with pre-war conditions are of little value owing to far-reaching changes in the economic milieu, and the method of correlation as applied to time series needs overhaul. Few investigations have hitherto been sufficiently extensive, for the behaviour of the figures must be observed over several economic cycles before trustworthy conclusions can be drawn.

Professor Bresciani-Turroni's paper deals in the main with the results of his investigations into economic fluctuations in Germany during the period 1924 to 1928, and touches only incidentally upon questions of technique. The three curves of the *Harvard* barometer are criticized from the standpoint of sequence: instead of the order A (speculation), B (business) and C (money), the order C, A, B is in his opinion to be preferred.

Karsten's "quadrature" theory of the relations between curves A and B is not accepted. The elimination of trend by linear or parabolic interpolation is not recommended, and the method of moving averages, although open to objections, is suggested as an alternative. It is, however, observed that certain important statistical series are little influenced by economic fluctuations, and

the author suggests that under certain conditions these series may afford a trend for more sensitive figures.

The crisis following the German business expansion of 1921-25 was due, according to Professor Bresciani-Turroni, to monetary causes, and statistics do not confirm the view that it was provoked by disequilibrium between production of consumers' goods and purchasing power. The causes of the revival of 1926 are analysed in detail: among them may be noticed the British coal dispute, the rationalization of German industry, and the influence of foreign credits. A new tension phase occurred in 1927, marked by banking changes and a rise in the rate of interest. Even, however, if foreign countries remained disposed to provide capital, expansion must ultimately stop because expectations of profit recede as a result of increases in wages.

In conclusion Professor Bresciani-Turroni emphasizes that the complex factors lying at the root of economic fluctuations cannot be reflected in the two or three curves of a "barometer." A minute analysis of the facts is of much more value.

L. R. U.

4.—*A Study of Interest Rates.* By Karin Kock. 252 pp. London: P. S. King. 1929. Price 12s. 6d.

In this volume, the first of a series of economic studies to be issued by writers connected with the Department of Economics of Stockholm University, the author propounds several questions. How far is a change in the discount rate fixed by the Central Bank in any country followed automatically by a change of a similar kind in other rates, such as the loan rates of the commercial banks, open market rates, bond rates, etc.? This is the main question discussed, and of course Miss Kock cannot give a short answer, for then she would not have needed to write a book. In pursuit of her enquiry she analyses three money markets, those of the United States, of Great Britain, and of Sweden. Miss Kock depends very largely upon her practical experience in the intelligence department of a Swedish bank. She is also well acquainted with the machinery and principles of the London money market, but she depends apparently on other writers for her account of American affairs. Nevertheless, she gives a very close study of banking problems and policy in the United States since 1919.

In the attempt to answer the question, why rates of interest vary, Miss Kock analyses the various risks which must be faced by bankers on one side, and on the other side the varying needs of borrowers. There are the question of security, the choice between long and short loans, and the terms of repayment. Both sides try to forecast the future, *e.g.* to determine whether rates of interest will rise or fall? Changes in the purchasing power of money seem to have less influence on the rate of interest. Miss Kock notices the distinctions between English and foreign banking, *e.g.* that our banks do not supply industrial capital, whereas the German banks do so. Again, our banks do not float loans; the Swedish banks act as issuing houses, "the banking syndicate takes the whole issue firm from the borrowers and

also undertakes the sale of the bonds." She holds the scales level between the older school which makes a banker merely the lender of money entrusted to him by depositors, and the new school which holds that deposits are the result of loans. The late Walter Leaf held strongly that banks cannot create purchasing power.

Does a speculative movement on the Stock Exchange drain the country's capital and thereby make trade and industry pay more for it? Miss Kock gives an uncertain answer. She does not hesitate, however, to criticize the Federal Reserve Board of the United States sharply for its failure to raise interest rates in order to check speculation and credit expansion after the war. After this we have an explanation of the method adopted by the Bank of England to control, so far as it can, the rate of interest in England, together with a discussion of the influence exercised by the Treasury. She recognizes that these two authorities, even when combined, have no autocratic power, they can only lead. In Sweden the banking situation since the war has been greatly complicated by the competition between the commercial banks and the savings banks. The Riksbank is more powerful now than it used to be; but there is no open money market in Sweden, hence the Riksbank lacks the opportunities for market operations which are open to other central banks. Miss Kock appears to have written the English version herself, though not without assistance: her English is surprisingly good, though she uses one or two ugly words like "illiquid," and the words "deposit rates" on p. 192 ought to be "rates of interest on advances."

J. E. A.

5.—*The Problem of Trust and Monopoly Control.* By A. P. L. Gordon. viii + 186 pp. George Routledge. 1928. Price 5s. net.

Mr. Gordon's book is "an attempt to analyse the proper relations between monopolistic combines and the State." It consists of two main parts: the first is an account of German experience of organized monopoly, and of the action taken by the German Government to prevent it from becoming a mere protection for inefficient producers; the second is an attempt to build up, from German and British experience, suggestions for "a system favourable to the expansion of industry without disadvantage to the public, combining the security of monopoly with the stimulus of competition."

Part I is a concise and thoughtful account of the recent history of the Kartell system, and the lessons to be drawn from it. Part II, after a discussion of the three main aspects—contract, competition, and price—under which monopolistic organizations may properly come within the sphere of legislation, describes the events which led up to the promulgation in November, 1923, of the Kartellverordnung (Decree to prevent the abuse of economic power). The essential nature of this decree is made clear: its concern with agreements rather than with the organized bodies making them; its Kartell Court of four members with a presiding judge; the supremacy of the Court over the authority of courts of law; the limitation of its powers in the case of Kartells established by law

or decree and of authorized modes of price control, where safeguards against exploitation are already provided; the regulation of the relations between member and Kartell, and between the Kartell and other parties; the powers of the Court in respect of boycotts and the impounding of good-faith deposits: all these features which constitute the Court "a permanent machinery for the supervision of Kartells and a means by which we may escape from the tyranny of organizations," are succinctly set forth. The working of the decree is examined.

From this well-ordered array of facts concerning German experiences and experiments the author steps out boldly to suggest the bases of a British trust and combine legislative policy. In his view the present position of our Common Law doctrine in regard to combinations in restraint of trade "cannot seriously be considered as an adequate check upon the abuses of monopoly," for that doctrine, devised to protect free competition, "has become a shield, not indeed to monopoly itself, but to the worst devices which the craft of monopolists could invent." Mr. Gordon does not suggest a tribunal on the German plan for this country; our rooted objections to a system of *droit administratif* make that impossible; but the matters to be considered and dealt with are not purely legal and are not appropriately within the province of ordinary courts of law. He submits, therefore, that "the proper course would be to establish a Combinations Commission, the personnel of which should be appointed by the Crown and suitably remunerated. It should consist of a lawyer, one representative apiece from the Treasury, the Board of Trade, and the Ministry of Labour, and three industrial representatives chosen from panels set up by the Board of Trade." This Commission should have powers, which the author briefly sketches, in regard to withdrawal from noxious agreements, the exercise or suppression of boycotts, the maintaining of prices at unfair levels, the making of detrimental international trade agreements, and the exploitation of the shelter accorded by tariffs or natural monopoly. For the proper functioning of such a body certain legislative changes would be necessary, mainly in the matter of asserting, in place of the "restraint of trade" doctrine, the principle that combinations between producers, even though monopolistic in tendency, are not unreasonable restraints. Mr. Gordon looks with some apprehension on the injury to effective competing power in world markets which Great Britain may suffer if combination among producers, with all its possibilities of higher efficiency, is repressed by legislation directed against the existence of monopoly instead of against the abuse of monopoly. J. II.

6.—*The Problem of Industrial Relations and other Lectures.* By Henry Clay, M.A., Professor of Social Economics in the University of Manchester. 322 pp. London: Macmillan. 1929. Price 12s.

Of the fourteen lectures and essays contained in this volume, the first four are concerned with the problems of industrial relations and wages adjustments before, during, and after the war. On the

subject of war-time wages Professor Clay, who worked at the Ministry of Labour from 1917-19, writes with authority.

Discussing industrial relations on the eve of the war, he states that the problem was limited to "adapting an established system of wages standards and terms of employment by piecemeal adjustments and slowly changing needs and conditions," and that "the pre-war solution was to make these adjustments in each industry with some regard to related and associated industries, mainly through the machinery of collective bargaining between trade unions and employers." There follows a detailed account of the various steps taken by the Government in the difficult war-time period for securing the adjustment of wages—the Committee on Production; the Munitions of War Act (making strikes and lock-outs illegal, and providing that no change in wages could be made in a Controlled Establishment without the consent of the Minister of Munitions); and the 12½ per cent. bonus. Not the least of the difficulties lay in the practice of one Government department consenting to advances in rates of wages for workers in establishments working for them and so leading to demands from workers in similar occupations employed in establishments working for other Government departments. Professor Clay forms the conclusion that, in war-time, either there must be a single department responsible for all wages questions independent of the various contracting departments that pay the wages, or some co-ordinating machinery to prevent dislocating decisions by one department acting independently.

Dealing with post-war wages problems, the author expresses the opinion that cost of living is an unsafe index of what industry can pay, because that cost depends mainly on the price of goods which British industry does not produce; and he advocates the use of an index of prices in which the prices of things that England sells have at least as much weight as the prices of things she buys. Such a proposal may be criticized if only on the ground that it would not be found possible to secure agreement on the kinds of things to be included in the index figures or the weights to be assigned to the various items.

In an essay on Export Trades and Unemployment Professor Clay refers to the burden of rates, which, as he states, "becomes heavier as output diminishes, since the aggregate amount to be paid does not diminish and the charge per unit of output increases." This was written before the De-rating Act was passed, and the burden will, of course, be mitigated by the operation of this Act.

An essay on the Whitley Reports and the Machinery of Conciliation contains a neat summary of the famous Whitley Report (the first of the five Reports issued by the Whitley Committee). It runs as follows:—"Stripped of its verbiage . . . its importance consisted of three things: it asserted the principle of trade union recognition, it embodied the outlines, though in too rigid a form, of any effective conciliation scheme, and it made a case for widening the scope of conciliation organization." In the same essay, where the author discusses the work of the Joint Industrial Councils, he puts his finger

on a weakness—"the lack of executive strength to carry out the ambitious objects with which their constitutions are all headed." The compilation of statistics, the drafting of schemes of industrial training, and other matters call for the continuous labour of specialists. The members of the Councils, however, are usually not trained statisticians or experts in technical education, etc., but are busy employers and overworked trade union officials, and the author suggests that "what the Councils have achieved so far is no indication of what a Council might achieve, that was prepared to incur the expense of maintaining a trained statistician, a lawyer and a secretarial staff on the scale that a Parliamentary Commission would employ for equivalent work, an expense that is trifling compared with the cost of a single stoppage in an industry."

Dealing with the subject of Government Intervention in Trade Disputes, Professor Clay is of opinion that it is not likely to succeed unless conducted on the lines of some consistent policy, and that such a policy is impossible without unified direction. He regards it as essential that all Government activities in relation to wages should be concentrated in the Ministry of Labour, with the Industrial Court for use where necessary. But what Prime Minister would have the strength of mind to resist pressure put upon him to take a hand in the settlement of an important dispute, and to say that it must be dealt with only by the Ministry or the Industrial Court?

An interesting suggestion is made in a paper on The Place of Arbitration in Industrial Disputes, namely, that every important dispute should be followed by a scientific "inquest" by an expert committee drawn from the statistical departments of the Ministry of Labour and the Board of Trade. The committee should make estimates of loss of production, loss of wages, profits and foreign trade, cost of relief, etc. "Such an estimate of cost would bring home to the most embittered partisan what the consequences of his action had been," and he would be more predisposed in the next crisis to take possible loss into consideration.

A paper on the Authoritarian Element in Distribution contains estimates of the growth in the ratio of expenditure on social services to the total wages bill. The ratio is 3.4 per cent. for 1880, 10.4 per cent. for 1913, and 14.7 per cent. (excluding war pensions) for 1924. These and other indications show that "without assuming the awkward and dangerous responsibility for fixing prices and incomes, Parliament has nevertheless interfered materially with the distribution of wealth, and has done much to secure a better distribution."

The last three papers in the volume deal respectively with Property and Inheritance, Distribution of Capital in England and Wales, and the doctrine of *laissez faire* ("A word for 'Laissez Faire'"). Professor Clay favours the maintenance of the present right to acquire property while advocating a yet wider diffusion of property. He argues, however, that the economic grounds on which the right to accumulate property rests afford no justification for the right to inherit property.

In such a collection of lectures and essays, many of which are on

inter-related subjects, it is perhaps inevitable that there should be some repetition of facts and arguments, but this is a positive gain if only one of these closely reasoned essays be taken at a sitting.

J. W. V.

7.—*Wages in Practice and Theory*. By J. W. F. Rowe, M.A., M.Sc. London: G. Routledge & Sons, Ltd. x + 277 pp. 1928. Price 10s. 6d.

The major portion of this volume is devoted to a study of the course of wages during the forty years 1886–1926 in five of the larger British industries, viz. Building, Coal-mining, Cotton Manufacture, Engineering and Railway Service, and of collective bargaining in connection therewith. The author subjects the available statistics in these industries to a very searching criticism. None of the criticism can be said to be unfair in any way, though it is a little surprising, in view of his opinions, to find the considerable use he has made of the wage statistics of the Ministry of Labour, but perhaps his principal ground of complaint is in the Ministry's combination of index-numbers of wages for the first four trades into an index-number for wages in general. The practice is unsound, no doubt, but we fancy that the general trend of wages is perhaps not incorrectly conveyed. Professor Bowley's index-numbers of wages and the author's own investigation into coal-mining wages* are also made use of, together with Mr. G. H. Wood's *History of Wages* in the cotton trade, which appeared in the pages of this *Journal*, and the report on railway wages which Mr. W. T. Layton prepared for the Railway Servants' Union in 1906. The author's aim throughout has been to arrive at the "true wage rates, that is, the current average rate of earnings," and after a close examination of his chapters on wage rates and his two interesting appendices (I and II), we think he has got as near to the absolute figures as his material would allow, and it is not easy to see where any fresh material of importance is to come from.

The study of the wages statistics in these five industries is, however, only a preliminary to the author's main purpose, which is to propound a new theory of wages, or at any rate to enter a caveat against the Marginal Productivity theory in its severest form. He holds that the bargaining power of Trade Unions now, whatever it might have been twenty or thirty years ago, is strong enough to maintain wages or increase wages for a period sufficiently long to compel better organization and greater efficiency in an industry. Increased production might thus do away with the necessity of a wage reduction. Professor Marshall, whose theory of wages may at the present time be said to hold the field, recognized that it was possible for a time to obtain increased wages by the possession of strong bargaining power, but he was of opinion that in the long run this had not much effect on the general trend of wages. The author claims that the effect on industrial organization of collective wages agreements is so considerable that in future it must be recognised in all wage theories as a definite and important factor in the

* *Wages in the Coal Industry*, 1923.

determination of the normal value of labour. He holds that the evidence of the five industries under review and that afforded by the trades brought under the Trade-Board Acts fully support this contention. We may add that an examination of the trend of wages in the printing trades, which are available for a period of fifty years at least, would in our opinion also afford some support to his contention.

There is a highly interesting chapter on wages and skill in the engineering trades, and an informing Appendix on "Changes in the equipment of an ordinary machine shop." They are well worth the considerable time and trouble which they must have cost.

W. A. B.

8.—*The Control of Wages*. By Walton Hamilton, Professor of Economics, the Brookings School, and Stacey May, Assistant Professor of Economics, Dartmouth College. 185 pp. New York: The Macmillan Company, 1928. Price 6s.

This volume is one of a series published under the general title of "The World To-day Bookshelf." The aim of the publishers is to supply "short, readable yet scholarly books to provide both stimulus and information for adult readers," and the authors of the volume under review help the reader along by heading each chapter with a wise saying of Mr. Dooley (most of them fairly apposite) and by using, occasionally, such terms as "pay envelope" and "boss," instead of "wages" and "employer." Notwithstanding such devices, however, the ordinary reader may not find the volume light reading.

The authors set out to describe various means whereby wages may, in their opinion, be controlled by and in the interests of the workers. Their suggestions include, (a) the setting up of standards of competence for managerial positions, and of "production standards" for measuring the efficiency of the work of operatives; (b) a tax, to be assessed against irregularities in the volume of employment, aimed at making it to the employers' advantage to keep the volume of production and of employment regular from year to year; (c) buying out shareholders by means of annuities running for a period of years; (d) research organizations "to examine objectively proposals for economic change."

A theory of wages is propounded. Briefly summarized, it is that the rate of wages paid in an industry or occupation is a combination of the labourer's real wage and the "free services" which he enjoys, either as an employee in industry or as a member of "the political order" (e.g. health service, education of children). J. W. V.

9.—*The Unemployed: Old Policies and New*. By Ronald C. Davison. xiii + 292 pp. London: Longmans, 1929. Price 10s. 6d.

This volume is the only satisfactory account in a moderate compass of the various measures that have been taken in Great Britain to deal with the problems of unemployment since the end of the last century. It is prefaced by a brief but sufficient account of previous agencies

and methods of dealing with unemployment and with pauperism. It should be noted, however, that the "Roundsmen" scheme of dealing with paupers referred to was one in which rate-paying employers had to find work *in turn* for the paupers of the parish for varying periods. The fact that the low price paid for the labour had to be made up out of the poor rate was common to other systems.

A chapter is then devoted to the principal kinds of relief works that have been tried during the last hundred years, and the author expresses his astonishment that they should have lasted so long. After his searching analysis of them and of their results he hopes, no doubt, that the last has been heard of them. In our opinion there is no chance of their final disappearance. And the reason is the strong appeal that is made to the all-pervading shallow idea that any kind of work for the unemployed must be superior to the provision of "money for nothing," *i.e.* unemployment benefit. Under whatever names and under whatever specious pleas they may be introduced, relief works in some form will be introduced from time to time as a consequence of the persistence of this idea.

The various national schemes of insurance against unemployment naturally occupy a large share of consideration, and it is pointed out that it was expecting too much of a newly instituted scheme of unemployment insurance, in addition to providing against the ordinary risks of trade depression, to provide for all the results accruing from a war of such a magnitude as that which had just ended. Justice is, however, done to the great endeavour of the State to fulfil, apart from insurance, its responsibilities to the ex-service men, and an account is given of the various measures adopted. "Never before or since has so much money been spent or so great a national effort made to restore individuals to employment."

In the author's opinion no scheme of insurance can possibly provide against all the varied forms of unemployment, and provision at the hands of local authorities of some kind of relief will still be necessary for a portion of the unemployed. How great this portion will be is not at present to be determined, but it must in all probability include a considerable body of defective labour and that part of the submerged or partially submerged class which all remediable steps have failed to reclaim.

The author has a chapter on "Migration from the Distressed Areas," and the conclusion, or at any rate the implication, is that its possibilities are subject to great limitations. An analysis of the unemployed workers is given from which it is apparent how varied are the types of unemployed and how difficult it must necessarily be to deal in the wisest manner with each of them. Perhaps the author is most severe on the misuse of juvenile labour and the haphazard way in which the juvenile is brought into industry. Parents, employers and the State are all in varying measures responsible for the number of adolescents of little industrial value annually put forth. Even "from the economic point of view it simply does not pay, for this is one of the sure ways to lay up a store of unemployment for the future."

The soberness and sanity of the comments throughout the volume make us regret their comparative scarcity.

So far as we have been able to discover, there is no defence or apology put forward for the absence of an index. W. A. B.

10.—*The Clothing Workers of Great Britain*. By S. P. Dobbs, B.A. With an Introduction by the Rt. Hon. Sidney Webb, LL.B., M.P. xiv + 216 pp. London: George Routledge & Sons, Ltd. 1928. Price 10s. 6d. net.

In his Introduction Mr. Sidney Webb refers to the process of disintegration and reorganization that is going on in the clothing industry. "In every centre of the industry," he says, "what is most manifest is the continuous transformation that is taking place, even whilst it is being observed," and the author of the volume does useful service in presenting a picture of the stage at which the industry now stands or, say, as it stood a year ago. He tells us that the purpose of his study is to give some idea of the various activities of the industry, of the places where it is carried on and of the people engaged in it. The branches of the Clothing Trades dealt with are Tailoring (Retail, Bespoke and Wholesale), the Mantle Trade, Light Dressmaking, and Shirts and Collars.

Mr. Dobbs gives an interesting description of the various ways in which work is subdivided and organized in each of the more important centres. He notes that there has been a tendency in recent years for the men's clothing trade (wholesale) to become more and more concentrated in Leeds at the expense of other centres. Referring to the decline in the number of handicraft tailors in London, the effect of which is "to compel even the proudest firms of all to consider the ways of their humbler but more numerous brethren who have frankly abandoned old methods of production and have introduced in varying degrees the principle of subdivisional work," he adds the opinion that "there are many places in Kingsway or the City where a suit every bit as good as the West End article can be obtained for somewhere about half the price of a similar production bearing a name famous in the sartorial annals of the past two centuries." This may be so, but the old West End firms may have to give much longer credit to their customers.

In a chapter dealing with the wage level and methods of wage payment, Mr. Dobbs gives some estimates of average earnings of certain classes of workers, but, since he omits to state whether they relate to a particular centre or whether they are averages for all centres together, the figures are not very illuminating.

There are valuable chapters on methods of wage payment, the Trade Boards set up for different branches of the industry, Trade Unions and Employers' associations, apprenticeship and homework. It is gratifying to note that, since the year 1914, fresh legislation, increased organization and changes in the technique of production have tended towards the elimination of the sweated worker.

The first appendix to the volume shows the numbers of persons engaged in the Clothing Trades in various districts of Great Britain,

but the source of the figures is not stated, and the reader is left to discover for himself that it is the Census of 1921. There is a useful bibliography, which, however, contains no reference to the Preliminary Report on the Third Census of Production (1924)—Clothing and Millinery Trades—which was published in the *Board of Trade Journal* of 1st December, 1927. J. W. V.

11.—Other New Publications.*

Donaldson (John). International Economic Relations. A Treatise on World Economy and World Politics. xxx + 674 pp. New York, London, Toronto : Longmans, 1928. Price 16s.

[An elaborate study of the economic and economico-political problems existing between nations at the present time. It falls into two sections, the first examining the geographical, social, political, legal, and territorial factors of national and world economic relations; the second dealing with economic structure, national and world-wide, its industrial basis, the interdependence of nations for raw materials, the exploitation of national resources and the control of these. An appendix of notes and references to the subjects discussed in the book, an outline for further study, and an index complete the volume. It is intended to issue a sequel dealing with trade, shipping, finance, and other forms of international exchange.]

Garnsey (Sir Gilbert), K.B.E. Limitations of a Balance Sheet. 41 pp. London : Gee & Co., 1929. Price 3s.

[This little book, intended for the guidance of shareholders, explains the purpose of a balance sheet, points out its limitations, and discusses the best methods of presentation, with a warning as to what inferences may and may not be drawn from a study of the figures.]

Hewitt (H. J.). Mediæval Cheshire : an economic and social history of Cheshire in the reigns of the three Edwards. xxiv + 212 pp. Manchester University Press, 1929. Price 21s. net.

[This study of an ancient city at the period of its zenith contains a store of material for the economic historian, which has been prepared with great care and presented in an attractive form, with maps, illustrations, and full bibliographical references. The detailed accounts of building expenditure should be of some assistance in illustrating this aspect of the value of money in the thirteenth century, and interesting evidence on the standard of well-being and the status of the peasant may be gleaned from the section on Population. Chapter VII, on "The Wiches," gives a detailed account of the salt industry, its costs and production, and the tolls levied thereon.]

Martin (P. W.). Unemployment and Purchasing Power. 85 pp. London : P. S. King, 1929. Price 4s. 6d.

[A plea for attacking the unemployment problem by the creation of new purchasing power to fill the gap which the author supposes to result from the diversion of part of the proceeds of industry to the provision of working capital. The particular method here suggested, but not insisted upon, is that of Government borrowing for the purpose of financing public works whenever a deficiency in purchasing power becomes evident, the flow of bank money to be regulated so as to maintain an even balance between production and spending power, and arrested in time to avoid inflation. This short essay is intended for ordinary

* See also "Additions to Library," p. 479 *et seq.*

readers rather than for experts, and considerable space is given to a simplified account of the relations between production and purchasing power and an examination of their reactions in the post-war period. The difficulties of obtaining the statistical data necessary for efficient control and those arising from the processes of international trading are touched upon in the last chapter.]

Mortara (Giorgio). *Prospettive Economiche*. Anno nono, 1929. xiii + 498 pp. Milano: Università Bocconi, 1929. Price 40 lire.

[The ninth issue of Professor Mortara's book is, in conformity with earlier volumes, a survey of the world's production, consumption, imports, and exports of the more important commodities, with a detailed study in each case of Italy's share therein. There is a forecast of prices and production of each commodity for the coming year. International economic conditions as regards transport by land and sea, hydro-electric power, and currency and finance are also surveyed.]

Perroux (François). *Contribution à l'Étude de l'Économie et des Finances publiques de l'Italie depuis la Guerre*. 357 pp. Paris: M. Giard, 1929. Price 50 frs.

[M. Perroux's study is in two sections: in the first he reviews the economic and financial problems of Italy during the years 1919-22. These were especially difficult owing to the relative poverty of the country and its civic immaturity as compared with England and France, but it is shown that there was a definite improvement from the beginning of 1922, before the advent of Fascism in October of that year. The second part examines the Fascist achievement, with its financial and fiscal innovations, and attempts to assess its influence on the general economic condition of the country.]

Porri (Vincenzo). *L'Evoluzione Economica Italiana nell'ultimo Cinquantennio*. 295 pp. Rome: C. Colombo, 1926.

[A survey of the economic development of Italy during the past fifty years and of the changes in the relative importance of her industries. Each of these is studied in detail, an entire section of the book being devoted to agriculture. This section gives the numbers employed, the acreage and produce of the principal crops, the number and size of holdings, and the incidence of import duties on the industry as a whole. Home and foreign trade, banking, tourist traffic, insurance, and thrift are investigated in a final section. The book ends with a note on the contribution of the "Knights of Labour" to the industrial development of the country.]

Power Resources of the World (Potential and Developed). Compiled by *Hugh Quigley* for the International Executive Council, World Power Conference. xii + 170 pp. London: World Power Conference, 1929. Price 21s.

[In the preface Mr. D. N. Dunlop, Chairman of the Executive Council of the Conference, explains the intention and scope of this survey, which represents an important step towards the assessment of the power resources of the world. The studies of the chief industrial countries prepared for the International World Power Conference of 1924 and the International Economic Conference of 1927 had no common basis of evaluation, and attempts to co-ordinate them have consequently proved unsatisfactory. No such attempt is here made, but all the statistics collected are brought together and supplemented by a bibliography of the various studies and articles which have been based on them since 1924, with a view to facilitating the international co-operation which is necessary for the attainment of a comparable basis, and generally preparing the ground for the task of co-ordination. Section I is concerned with general considerations and the discussion of various

estimates; Section II gives figures of coal, gas, and oil production; Sections III and IV are devoted respectively to hydraulic and electrical power; Section V attempts to estimate the world power production of 1927 as a common basis, and is followed by a brief but useful summary of conclusions.]

Ratner (G.). Agricultural Co-operation in the Soviet Union. Edited by the Horace Plunkett Foundation. Translator: M. Digby. xii + 90 pp. London: Routledge, 1929. Price 3s.

[A statistical study of the present condition of agricultural co-operative societies in Russia, and of their growth during the past few years. The organization, administration, and limitation of their activities under the law on agricultural co-operation are explained, figures of their trading activities, supply, sales, and total turnover since 1923 are given, and their financial position is examined. The latter varies in different regions according to the general economic conditions, but in the main, despite their large resources, the co-operatives are still greatly hampered by lack of capital. Nevertheless, they have contributed substantially to the technical development of agriculture and to the improvement of the general economic condition of the peasantry. The book concludes with an account of the foreign trade of the agricultural co-operatives and of their agencies abroad.]

Virlogeux (Maurice). Quelques aspects de l'Évolution des Prix au siècle dernier et en notre temps. 204 pp. Paris: M. Giard, 1927. Price 25 francs.

[The sub-title of this book is "Theories and Realities," and the task the author set himself was to disclose the fundamental causes of price variations by means of a scientific study of these variations and their accompanying phenomena. He reached the conclusion that the monetary factor was by no means that primarily responsible; that changes in the quantity of money were frequently an accompaniment, a secondary cause, or even an effect, of changes in prices; and he challenges the "quantitativists" for having assigned the rôle of "orchestral conductor" to a mere member of the band whose gestures were conspicuous. In support of his argument Dr. Virlogeux offers a detailed study of economic and financial variations in two periods often regarded as typical examples of the operation of the monetary factor, namely, the decades 1850-60 and 1914-24. The movements of prices, production, exchange, foreign trade, freights, currency, credit, savings, etc. in those periods are traced, compared, and minutely analysed, the main curves being shown in a series of excellent graphs. The book opens amusingly with a malicious illustration of the dangers encountered in using statistics, and is readable as well as elaborately reasoned; the number of printing errors is regrettable.]

CURRENT NOTES.

In the first five months of 1929 exports of British produce and manufactures exceeded in value those of the corresponding period of 1928 by £13,090,000, or $4\frac{1}{2}$ per cent. If allowance be made for changes in prices, the increase in the volume of exports was probably somewhat greater, since in the first quarter of 1929 export values were on the average about 2 per cent. lower than a year earlier. The whole of the increase in the value of exports this year, as compared with a year ago, was concentrated in the months of April and May, an increase in January as compared with last year being counter-balanced by a reduction in March. The total for May was actually in excess of that for any month since November, 1927. Exports of coal in the first five months of the year aggregated 23,210,000 tons, and were 15 per cent. greater than in the same period of 1928. There has also been an improvement in the value per ton (f.o.b.) realized for coal exported from 15s. 6d. per ton in January to 16s. 3d. per ton in April; in May, however, the figure fell back slightly to 16s. 1d. per ton. Exports of Iron and Steel and Manufactures thereof were nearly 10 per cent. greater in tonnage in the first five months of this year than last year, while the imports were reduced in tonnage by 17 per cent. Exports of cotton piece-goods aggregated 1,710 million square yards in the first five months of 1927, which was about 3 per cent. greater than the figure for the first five months of 1928, but somewhat below that for the same period of 1927. Bombay proved a disappointing market, but there was a welcome recovery in the exports to China and Hongkong. Exports of woollen and worsted tissues so far this year were somewhat smaller than they were a year earlier, while imports of those tissues showed little change.

The value of the total imports of merchandise in the five months ended May exceeded those of the corresponding period of 1928 by £7,513,000, or $1\frac{1}{2}$ per cent., and allowing for the fall in average values the increase in volume was probably about 4 per cent. As with exports, the increase compared with a year earlier was attributable to the months of April and May. The increase was concentrated

in the Food, Drink, and Tobacco, and in Articles wholly or mainly manufactured, imports of Raw Materials showing little change in value on balance. The retained imports of raw cotton increased from 597 million lbs. in the first five months of the year. The increase, however, went into stock and was not followed by increased activity in cotton spinning, for according to the statistics of the Liverpool Cotton Association the deliveries of raw cotton to the mills were practically identical in these two periods. Retained imports of sheep's and lambs' wool amounted to 355 million lbs. in the first five months of 1928 and 321 million lbs. in the same period of the year. The reduction was probably partly due to merchants holding back in view of the fall in prices which has been taking place. The increase in the value of our imports of manufactures compared with a year ago was mainly due to greater imports of goods which are not produced to any considerable extent in this country, particularly refined petroleum oils (mainly motor spirit and lamp oil), and of non-ferrous metals (mainly copper bars, blocks, etc., and pig and sheet lead).

Re-exports in the first five months of the year fell off by £5,069,000, or 9 per cent. compared with a year earlier. This decrease was concentrated in the raw materials class and was almost entirely accounted for by a reduction in re-exports of raw rubber, particularly to the United States and to Germany. The actual quantity of rubber re-exported fell from 1,030,000 centals of a hundred lbs. to 550,000 centals, while the value of it was reduced even more, from £6,897,000 to £2,461,000.

The following table compares the overseas trade of the United Kingdom in the twelve months ended May, 1929, with that in the previous twelve months. The figures for June, 1929, are not available at the time of going to press.

Movements and Classes.	Twelve Months ending May 31, 1929.	Twelve Months ending May 31, 1928.	Increase (+) or Decrease (—) in Later Period.
Imports, c.i.f.—	£'000.	£'000.	£'000.
Food, drink, and tobacco	534,550	541,839	— 7,289
Raw materials and articles mainly un- manufactured	335,068	343,248	— 8,180
Articles wholly or mainly manufac- tured ...	321,822	314,820	+ 7,002
Other articles ...	13,014	6,507	+ 6,507
Total Imports ...	1,204,454	1,206,414	— 1,960

Movements and Classes.	Twelve months ending May 31, 1929.	Twelve months ending May 31, 1928.	Increase () or Decrease () in Like Period.			
Exports, f.o.b.—						
<i>United Kingdom Produce and Manufactures—</i>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	55,035	53,025	+ 2,010			
Raw materials and articles mainly un- manufactured	73,948	72,109	+ 1,749			
Articles wholly or mainly manufac- tured ...	585,737	576,396	+ 9,341			
Other articles ...	21,797	16,862	+ 4,935			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	27,292	26,403	+ 889			
Raw materials and articles mainly un- manufactured	60,982	71,656	-10,674			
Articles wholly or mainly manufac- tured ...	26,703	25,119	+ 1,584			
Other articles ...	306	185	+ 121			
Total Exports ...	851,800	841,845	+ 9,955			
Bullion and Specie—						
Imports ...	62,966	36,646	+26,320			
Exports ...	60,180	44,165	+16,015			
Movements of Shipping in the Foreign Trade—	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	31,453	40,071	32,757	40,282	-1,304	- 211
Foreign ...	24,744	20,348	26,477	19,914	-1,733	+ 434
Total entered ...	56,197	60,419	59,234	60,196	-3,037	+ 223
<i>Cleared with cargoes—</i>						
British ...	39,184	44,080	37,893	42,541	+1,291	+ 1,539
Foreign ...	22,193	21,966	21,640	20,785	+ 547	+ 1,161
Total cleared ...	61,377	66,046	59,539	63,326	+1,838	+ 2,720

As measured at the Board of Trade, the general average of wholesale prices in March was higher by 1.2 per cent. than in February, the index-numbers for the two months being 84.3 and 85.3 respectively (1924 = 100). The averages for food and for industrial materials showed increases of 1.0 per cent. and 1.5 per cent. respectively. A fall of 1.2 per cent. for cereals was more than balanced by increases of 1 per cent. in meat and fish and 3 per cent. in miscellaneous foods. Textiles other than cotton and miscellaneous

material, were the only exceptions to the upward movement in the prices of industrial materials. Average prices for April as compared with March reduced the total index-number by 1.1 per cent., bringing it to 83.5. Food cheapened by an average of 1.6 per cent. in spite of an increase of 0.3 per cent. in meat and fish prices, and industrial materials fell by 0.6 per cent., the only group showing an increase being iron and steel, for which prices rose by 0.6 per cent. These changes in the total index-number left it still slightly above the level for the last month of 1928, when it stood at 83.1. Taking the average for 1913 as 100, the index for all articles for April was 138.8, the figures for the 53 articles of food and for the 97 industrial materials being 147.8 and 133.9 respectively. For the smaller groups included in these, the indices ranged from 113.9 for iron and steel to 159 for cotton and 160.4 for miscellaneous food-stuffs.

According to the *Economist* index-number of wholesale prices, the general level at the end of March showed a fractional rise of approximately one-half of 1 per cent. since the end of the preceding month and a rise of nearly 1.2 per cent. above the figure recorded at the end of 1928. According to the new basis of this index-number, in which prices for 1927 = 100, the level at the end of March was measured by a figure of 96.1. The slight increase in the general index-number during March was attributable to higher prices for industrial materials, among which a sharp advance in mineral prices was the most marked, while food prices on the average declined. During April the upward tendency of wholesale prices in February and March was definitely reversed, the average level during that month falling by 2.2 per cent. and producing an index-number of 94, as compared with 101.4 a year before. Expressed as a percentage of the average for 1913, the index figure for the end of April was 135, the range in the principal groups being from 104.5 for the miscellaneous group to 174.9 for foods other than cereals and meat. The *Economist* also quotes its index-number calculated with 1924 as the base year; on this basis the figure at the end of April was 81.2 as compared with 83.1 a month before and 81.8 at the end of January.

As measured by the *Statist* index-number, movements of wholesale prices in March moved very slightly upwards by 0.3 per cent. The index-number at the close of the month was 120.5, as against 120.1 at the end of February, and 123.6 at the end of March, 1928. The *Statist* attributed the slight increase in the average level during

March mainly to speculative activity in the metals market. It was followed by a sharp fall of 3·3 in April, which brought the index-number to 116·5, or 7·2 per cent. below what it was a year before, and narrowed to 43·5 per cent. the increase in wholesale prices that had taken place since the outbreak of the war. This fall of prices during April was well distributed over all the groups of the index-number with the single exception of the animal foods group. Apart from seasonal factors, as in the case of potatoes, the *Statist* concluded that these changes reflected the operation of a general monetary factor, which it found in the higher money rates adopted by European countries as a defensive measure against the attraction of high rates in the United States. The end-of-April index-number at 116·5 was lower than any monthly figure recorded since November, 1915.

According to the returns collected by the Ministry of Labour as to movements of retail prices in Great Britain and Northern Ireland, between March 1 and April 2 there was a marked decline in the average level of the retail prices of food, due largely to the disappearance of the severe weather conditions and to the operation of seasonal influences usual at that period of the year. Expressed as a percentage of the average prices in July, 1914, the level between the dates mentioned fell from 157 to 150, as compared with 155 on April 1, 1928. During April seasonal decreases in dairy produce occurred, and to these was added the effect of the abolition of the tea duty. But these downward movements were counteracted by higher prices for bacon and, in a less degree, for butcher's meat, so that the average level of retail food prices fell only by one point to 149 on May 1, as against 154 a year before. If account be taken of all the items included in the family budget in addition to food, the index of general retail prices, which stood at 166 on March 1, fell to 162 a month later, and by a further slight reduction to 161 on May 1, as compared with 164 on May 1, 1928. Since the expenditure on food represents 60 per cent. of the total expenditure in the original family budget, it would appear that the level of retail prices other than food remained at approximately 179 in March and April, the principal items in this average being rent (153), clothing (215 to 220), and fuel and light (170).

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some

similar pre-war period; the fourth column gives the estimated percentage increases for all items covered by the budget in each case, such items, in addition to food, comprising, generally, rent, clothing, fuel and light, and other household requirements:—

Country.	Date of latest Return.	Food.	All Items.
<i>Overseas Dominions, etc.</i>		Percentage increase.	Percentage increase.
Australia	March, 1929	60	46 (3rd qr. 1928)
Canada	April, 1929	50	56
India (Bombay) *	April, 1929	45	48
Irish Free State ...	January, 1929	73	77
New Zealand	March, 1929	46	61
South Africa	March, 1929	17	32
<i>Foreign Countries.</i>			
Belgium	March, 1929	—	762
Czechoslovakia (Prague)	March, 1929	813	636
Denmark	April, 1929	50	74
Egypt (Cairo)	January, 1929	46	—
France (Paris)	April, 1929	515	447 (1st qr.)
France (other towns) ...	February, 1929	476	—
Germany	April, 1929	54	54
Holland (Amsterdam) ...	December, 1928	—	68
Italy	March, 1929	471	444 (Milan in Feb.)
Norway	April, 1929	56	80
Spain (Madrid)	February, 1929	83	—
Sweden	April, 1929	50	71
Switzerland	March, 1929	56	61
United States	March, 1929	50	71 (Dec. 1928)

* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland quoted on p. 291 of Part II, 1929, of the *Journal*, the *Labour Gazette* observed during March a substantial and general improvement in the situation, and a further though less marked improvement in most industries took place during April. Among the workpeople, numbering approximately 11,880,000, insured against unemployment in Great Britain and Northern Ireland, the percentage unemployed in all industries taken together was 10·1 on March 25, as compared with 12·2 on February 25. By April 22 the percentage had fallen to 9·9, which, however, was still greater than the figure of a year before, viz. 9·5 on April 23, 1928. The total number of applicants for employment registered at Employment Exchanges in Great Britain and Northern Ireland, which was 1,430,000 on February 25, fell to 1,168,000 on March 25, then rose slightly to 1,175,000 on April 22, which was practically identical with the figure of a year before.

Official statements as to employment in Germany quoted from the *Reichsarbeitsblatt* by the *Labour Gazette* showed that in February, contrary to the experience of past years, employment became worse, but there was a general improvement in the following month. During February the number of workpeople recorded by the Employment Exchanges as seeking work rose from 3,003,000 to 3,229,000, but by the end of March this number had fallen to 2,670,000. Returns from national trade unions with a total membership of over 4½ millions showed a percentage of unemployment among their members amounting to 22·3 on February 23, as compared with 19·4 at the end of January; on March 30 this figure had fallen to 16·9, which was still very much in excess of 9·2, the figure at the end of March, 1928. In France during March and April the amount of unemployment, as measured by the number of unemployed persons remaining on the "live register" of the Exchanges, remained purely nominal, the figure remaining below 10,000. In the case of Norway the trade union percentage of unemployment rose from 17·6 to 18·0 during January, then fell again to 16·6 during February, as compared with 20·5 at the end of February, 1928. In Sweden the comparison with a year before gave an unfavourable result, for while the trade union percentage of unemployed fell from 14·8 to 14·6 during February, and further to 14·2 during March, the last figure was still above that of a year before, viz. 13·1. In the third Scandinavian Kingdom, returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange showed that out of over 272,000 workpeople, 30 per cent. were unemployed on February 28, as against 27·6 per cent. at the end of the preceding month. By the end of March the figure had fallen to 23·3 per cent., which was somewhat less favourable than the figure of 21·3 per cent. at the end of March, 1928.

In Canada the index-number of employment now rests upon returns received from over 6,500 firms employing nearly one million workpeople, and has as its base the average volume of employment during the year 1926. Standing at 110·5 for February, it rose to 111·4 for March, then relapsed to 110·4 for April, though the last figure still showed an improvement on April, 1928, when the index stood at 102·3. The monthly report on employment issued by the Federal Department of Labour Statistics at Washington is now based upon returns received from over 27,600 establishments employing over 4½ million workpeople. On this basis it showed an increase in the volume of employment amounting to 1·9 per cent. between January and February, and in March there was a further expansion of 0·8 per cent. The index-number of employment, which continues

to rest upon returns received from over 12,000 establishments in 54 of the chief manufacturing industries, now has as its base average monthly employment in 1926; upon this base the index-number for March was 98.6, as compared with 97.4 in February, and 93.7 in March, 1928.

In Vol. XII (pp. 25-40) of the *Transactions of the Faculty of Actuaries*, Dr. W. F. Sheppard publishes the substance of an address intended to present some of the difficulties at the root of the subject of probability. "It is good for us all, occasionally, to pause and have a look round and see whether our work is based on sound principles." On the whole, clouds are dispersed and light let in upon the darker mysteries of "probability," but perhaps nowadays there are fewer who will fall into the toils and need the warning luminant. The subject of inverse probabilities is dealt with somewhat half-heartedly, and a novice would go away happier if he were clearly told that probabilities are only the other end of an argument beginning with postulates, and since postulates are granted there are no inverse probabilities.

For example, our vision seems to become a little dim (to be directed upon the problem of fitting a normal curve to a set of errors) when it reads, "we can from the data find the most probable values of the mean and other constants. But here again we ought to know something of the relative frequencies of the different values of the constants in distributions of this type." Yes, certainly we should, in fact *must*, if a probability is demanded and has to be given, but the probabilities given will have a life just as long as and no longer than the life of postulates, ability to lay down which with any confidence would involve the possession of knowledge almost amounting to divination. It is for this reason that one conceives a curiosity to learn why the probability of the fitted curve is demanded. If fitted curves or hypotheses can be given each a mark of goodness (the fit of the sample), is not this sufficient without trying to count how many of each sort we can speculate there might be supposed to be?

The current number of *Biometrika* contains an application of the statistical method to an historical problem. Under the title "Biometry and Chronology," Prof. Karl Pearson, after a brief reference to Newton's work in his later years on "The Chronology of Ancient Kingdoms amended . . ." examines critically Condorcet's solution of his proposition to apply "probability" to the historical assertion that the seven kings of Rome reigned for 257 years.

Condorcet, assuming that reigns commence at ages between 30 and 60, and with arithmetically diminishing frequencies in accordance with de Moivre's arithmetical law of life survivorship, and have lengths in accordance with the same life law, that is, that the frequency of length of survival is even, the limit being 90 years, obtains the probability formula for length of reign (putting A for the symbol in place of x , which suggests a quantitative connotation):

$$\frac{1}{\frac{1}{2}(60+30)(60-30+1)} \left\{ \frac{60-30+1}{1-A} A - \frac{A^{30} - A^{60+1}}{(1-A)^2} A \right\}^*$$

Hence the probability that 7 reigns will total 257 years exactly is the coefficient of A^{257} in the formula raised to the power 7, which Condorcet evaluates. He deduces the probability of a total of 257 years or over by means which are the subject of criticism and obtains the large value .25.

Prof. Pearson gives a modern solution, using continuous variates. For data of lengths of reign of kings he takes 250 European sovereigns and finds the four moments and a Type I curve of good fit. From the four moments he deduces the four moments of means of random samples of seven reign lengths and finds the equimomental bipolar curve, which is also Type I (beta). Integrating the tail by graph he finds, as the chance that 7 reigns will last 257 years or over, the much smaller value .005.

Next, the problem was passed over to an actuary, and C. F. Trustram finds a general algebraic solution, and employing the H^M life table and a linear smoothing process obtains an arithmetical result, the probability now being a little lower, .003.

Some idea of the typographical length of this fuller investigation may be had when it is stated that the figure 257, which is not lettered, appears in the expressions no less than 330 times!

* Since Prof. Pearson's proof is hard of reading (Condorcet is said to give none), the following is suggested as the proof:

From 60 kings aged 30 the reigns are arrayed, $A + A^2 + \dots + A^{60}$, or $A \frac{1-A^{60}}{1-A}$.

From 59 kings aged 31 the reigns are arrayed, $A + A^2 + \dots + A^{59}$, or $A \frac{1-A^{59}}{1-A}$.

From 30 kings aged 60 the reigns are arrayed, $A + A^2 + \dots + A^{30}$, or $A \frac{1-A^{30}}{1-A}$.

Hence, adding,

From $\frac{1}{2}(60+30)(60-30+1)$ kings of all commencing ages the lengths of reign are arrayed,

$$\frac{60-30+1}{1-A} A - \frac{A^{30} - A^{61}}{(1-A)^2} A;$$

whence for one king, by dividing by $\frac{1}{2}(60+30)(60-30+1)$, the probability formula for length of reign is obtained as above.

Truly something may be said for mathematical short cuts, although tail integrals derived from moment-fitted bipolar curves are risky, and tails have been known to go up when they should go down!

OBITUARY.

FRANCIS G. P. NEISON.

MR. FRANCIS G. P. NEISON, who died recently, was elected a fellow of the Society in May, 1869, having been proposed by Samuel Brown and seconded by Farr. He served on the Council almost continuously for thirty years from 1878. It is interesting to record that his father had also been a fellow of the Society and had written several papers on statistical subjects between 1844 and 1853. Mr. Neison had a large practice as a consulting actuary and brought to it sound common-sense and a natural gift of dealing with figures and of reading their meaning. His work brought him into contact with Friendly Societies, and he contributed a paper to the Society (*Journal*, 1877) on "Some Statistics of the Affiliated Orders of Friendly Societies" (Oddfellows and Foresters), and in 1872 he read before the Institute of Actuaries a paper on the influence of occupation on health with special reference to mining. Among his other statistical contributions was a report on accidents in mines and railways. On the personal side the impression he leaves to a younger generation is that of a cultured Victorian.

W. P. E.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Annals of Eugenics, October, 1928—The problem of alien immigration into Great Britain illustrated by an examination of Russian and Polish Jewish children. Part III. Section F.: *Karl Pearson* and *Margaret Moul*. The growth curves of certain characters in women and the inter-relationship of these characters: *E. M. Elderton* and *Margaret Moul*. A study of the epidemiology of measles: *Percy Stocks* and *Mary N. Karn*.

Bankers' Magazine—

April, 1929—Budget prospects. A banker's forecast: *Denarius*. The movement in the volume of bank deposits, etc.: *L. P. Galpin*.

May, 1929—The budget. Nationalization of banking: *Frank Morris*. Conversion of the third war loan: *E. G. Peake*.

Department of Agriculture, Journal, Vol. XXVIII. No. 2—Report on large-scale wheat experiments, 1926-27.

Economica, *April*, 1929—Allyn Abbott Young. Address delivered by *Sir William Beveridge* at the memorial service. Labour problems in two worlds: *L. M. Friedlander*. The domestic servants of the eighteenth century: *D. Marshall*. The repeal of the corn laws, 1846: *J. A. Thomas*. Notes on some probable consequences of the advent of a stationary population in Great Britain: *Lionel Robbins*.

Eugenics Review, *April*, 1929—Twenty-one years of eugenics: *Leonard Darwin*. Sex-ratios and marriage: *G. H. L. Pitt-Rivers*.

Faculty of Actuaries, Transactions—

Vol. XII. Part V. No. III—Recent developments of osculatory interpolation with applications to the construction of national and other life tables: *J. Buchanan*. Report on results of the continuous investigations of the mortality experience of life annuitants, 1921-25: *W. Palin Elderton* and *H. J. P. Oakley*.

Vol. XII. Part VI. No. 112—The statistical groundwork of investment policy: *C. M. Douglas*.

Institute of Actuaries, Journal, *March*, 1929—Opening address by the President: *Abraham Levine*.

Institute of Actuaries, Students' Society, Journal, Vol. III. No. 3—High-yielding Stock Exchange securities: *D. G. S. Cutler*.

Institute of Bankers, Journal, *April*, 1929—The marketing of coal. Lecture I: *Prof. J. H. Jones*.

UNITED KINGDOM—*Contd.*

- Ministry of Agriculture, Journal, April, 1929*—Cost accounts on an institute farm: *J. W. Reid.*
- Public Administration, April, 1929*—The management of public utility undertakings: *The Rt. Hon. Neville Chamberlain, Sir H. N. Bunbury, J. H. Broadley, and E. Bevin.* Some financial aspects of the reconstruction of local government: *C. D. Johnson.* Mainly about the King's English: *Sir Ernest Gowers.*
- Royal Agricultural Society, Journal, Vol. 89, 1928*—Sugar beet; position and outlook: *The Rt. Hon. Ernest G. Pretyman.* Forestry and labour: *The Rt. Hon. Lord Clinton.* Farming in Yorkshire: *G. C. A. Robertson.* The live-stock of Yorkshire: *A. W. Anderson.*
- Royal Sanitary Institute, Journal, May, 1929*—Industrial diseases and their prevention: *Sir Humphry Rolleston.*
- Surveyors' Institution, Journal, April, 1929*—Assessment of park land: *A. Lacy Scott.* Valuation and assessment of golf courses: *A. B. Thornton.*

INDIA—

- Indian Journal of Economics, April, 1929*—Indian labour organization and forced labour: *P. P. Pillai.* Business forecasting: *K. B. Madhava.* Export duties in the Indian Empire: *E. H. Solomon.*

UNITED STATES—

- Actuarial Society of America, Transactions, Vol. XXIX. Part II. No. 80*—The use of least squares in interpolation: *Kingsland Camp.* Divergent developments of life insurance in Britain and America: *Henry Moir.* International congress. Correspondence concerning proposed occupational mortality investigation in Europe.
- American Academy of Political and Social Science, Annals, May, 1929*—Women in the modern world.
- American Economic Review, March, 1929.* Supplement—Market shifts, price movements, and unemployment: *S. H. Slichter.* Some observations on unemployment insurance: *Leo Wolman.* Price stabilization: *O. M. W. Sprague.* London and the trade cycle: *R. G. Hawtrey.* Federal reserve policy and brokers' loans: *H. L. Reed.*
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LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part II, 1929, the Society has received the publications enumerated below :—

I.—OFFICIAL PUBLICATIONS.

(a) United Kingdom and its several Divisions.

United Kingdom—*Overseas Trade, Department of—*

Reports on the financial and economic conditions, etc. as follows : Angola (Portuguese West Africa), (February, 1929), 1s.; Belgium (1928), with an annex on the Grand Duchy of Luxemburg, 4s. 6d.; Czechoslovakia (March, 1929), 1s. 6d.; Finland (March, 1929), 1s.; Poland (1928), 1s. 6d.; Province of the East Coast of Sumatra (1928); Sweden (1928); Switzerland (February, 1929), 1s. 6d. (The Department.)

(b) India, Dominions, and Protectorates.

India—*Gazetteers—Agra and Oudh. Supplementary notes and statistics—*

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Irish Free State—*Industry and Commerce, Department of.*

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Canada—

Natural Resources Intelligence Service. The Hudson Bay region. 50 pp. Ottawa, 1929. (The Service.)

East Africa—

Zanzibar. Statistics of the Zanzibar Protectorate, 1893–1928. 24 pp. Zanzibar, 1929. (Chief Secretary, Zanzibar.)

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JOURNAL
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PART IV, 1929.

THE MEASUREMENT OF TARIFF LEVELS.

By A. LOVEDAY, M.A.

[Read before the Royal Statistical Society, May 28, 1929, the President,
Mr. A. W. FRUX, C.B., in the Chair.]

I SUBMIT this paper with some hesitation, because I do not come before you with a problem solved but in search of light. My object is to promote discussion.

As you are all no doubt aware, the World Economic Conference, which met in Geneva in the early summer of 1927, devoted much of its energies to questions connected with commercial policy, to customs duties, import prohibitions and other obstructions to the free flow of goods from country to country. Certain members of the Committee which was appointed to prepare the agenda of the Conference and determine the character and scope of its documentation felt the need of some measure, however rough, of the relative height of the dams by which the flow of goods was in fact checked at this frontier or at that. They believed, and no doubt rightly, that the delegates at the Conference would be aided in their deliberations could they come to them with some knowledge of the general order of the magnitude of these obstructions in their mind. After protracted debates, this Preparatory Committee asked the Chairman of the Commission to determine the documentation relating to commercial matters. The Chairman, the late Professor Allyn Young, finally decided to request the Secretariat of the League of Nations to make a statistical enquiry into the level of tariffs.

The Secretariat in its turn proceeded to submit certain proposals concerning the methods to be employed to Prof. Allyn Young himself and Mr. W. T. Layton which were approved by them and ultimately applied in the document circulated to the Conference, entitled "Memorandum on Tariff Level Indices." That memorandum, which was distributed before publication to certain members

of the Preparatory Committee for their observations, and printed together with the observations received, gave rise to lively discussions at the time of the Conference and is still not infrequently debated at Committees and meetings of persons concerned with problems of commercial policy. Persons concerned with problems of commercial policy are not, however, necessarily either expert economists or scientific statisticians, and although these debates have given birth to some suggestions and criticisms of great value and pertinence, the arguments most frequently heard are rather interested than interesting.

I have myself often been reminded, when listening to this piping of national horns, of the "Three Jovial Huntsmen" rendered immortal by Randolph Caldecott:—

" One said it was an index, but another he said ' nay ' ;
It's nothing but a free-trade squib to blast our walls away.
Look ye there ! "

But Geneva, which lies somewhere between Manchester and Moscow, believes, I understand, not in free, but in " freer trade," so that this accusation, fortunately, does not receive serious support.

My intention this evening is to submit certain abstract and practical considerations, and in the more tranquil atmosphere which broods over this learned body to endeavour to ascertain within what limits and by what methods it may in fact be possible to devise some measure of what for the moment I shall call tariff levels.

All problems of measurement involve two initial difficulties: (a) the isolation of the phenomena, (b) the selection of an appropriate instrument of measurement.

Phenomena to be measured.

A customs tariff consists of a list (or lists) of duties imposed on goods entering into a customs area on certain defined conditions, and expressed either as absolute sums of money or as percentages of the prices at which those goods are valued for customs purposes. These duties are severally applied to defined commodities or groups of commodities specified in the same list. Against each particular commodity (or group) one, two, or more rates of duty may be indicated to be applied in accordance with the terms of the legislation and international conventions actually in force.

An average of these duties, weighted or unweighted, can obviously be computed. Such an average might be expressed either as an average amount or as an average rate. If the former system be employed, all ad valorem duties must be converted into specific; if the latter, all specific duties must be converted into ad valorem.

If the lists of commodities taxed were identical in all countries and remained unchanged from year to year, the computation, on the principles normally employed for gauging price movements, of indices capable of measuring differences between areas and variations over periods of time, would present much less serious difficulties than is in fact the case. Actually the number of items of which customs schedules are composed covers a range stretching from a hundred or less to several thousands.

It is necessary, therefore, to link these diverse phenomena to some common basis, to project the conception of the tariff beyond the list of the goods actually taxed. What should that common basis be?

I believe that the first attempt to measure tariffs by means of indices was that made by the Board of Trade in 1904.* Various methods of measurement are discussed in the introductory paragraphs of this memorandum, which is a model of lucidity, and the following conclusion is finally reached. "There only remains one method to be considered, *viz.* to calculate approximately the mean ad valorem equivalent of the import duties imposed by each country on the main classes of manufactures which are exported from the United Kingdom *to all destinations* [original italics] and not solely to the particular market under consideration." The common basis here adopted was thus the main classes of British manufactures, and this basis was applied to all the countries considered without reference to the purchases each actually effected in the United Kingdom. A similar procedure was adopted in the more recent enquiry published in the *Survey of Overseas Markets* made by the Committee on Industry and Trade in 1925.

The results of these enquiries, although interesting and important from the point of view of British trade, are not, however, subject to a wider interpretation than was originally intended, and there is no reason to believe that were another country with a different group of exports to make a similar enquiry its indices would be the same. On the contrary, it is easy to prove that they would, in certain cases, be widely different.

The conception of the problem which underlies these two British investigations is, however, one which can in theory be automatically extended to indices intended to be of world and not only of national significance. Such indices would show the extent to which, not British goods, but all goods constituting international trade were subjected to import duties when entering this or that customs area. The common basis would then be the whole list of commodities of which international trade is composed. The League of Nations, in the Memorandum on Tariff Level Indices to which I have already

* Second Series, Cd. 2337 of 1905.

referred, employs exactly this basis. "The expression 'tariff level' may be taken to mean a magnitude which is equal to the average of the percentages which the duties imposed by any given country constitute of the values of the commodities which go to compose the whole catena of goods normally entering into international trade." *

In practice it is, of course, quite impossible to take into account all goods internationally exchanged and, for reasons which I shall state later, it is clear that, even were such a course practicable, a certain amount of paring would be theoretically justifiable. Further, the above quotation—when placed in its present context—begs the question to which it will be necessary to revert—whether the average should be shown as an absolute figure or as an average of ad valorem rates. But, apart from this point, it presents, I believe, a correct, though not necessarily the only, definition of the term tariff level.

The exact significance of the underlying conception of the problem can perhaps be most easily brought out by a consideration of certain other proposals which have been made in this connection.

It is sometimes contended that a uniform list of goods is not only not required but is definitely misleading, as it fails to take account of the fact that the relative importance of each individual commodity to the economy of different countries varies. Those who hold this view suggest as a rule that the correct procedure is to take for each country whose tariff is being measured either the imports of that country or the production less exports plus imports, which, if variations in stocks be ignored, equals consumption.

This import list theory is obviously liable to the logical *reductio ad absurdum* that, if any country imposed a duty on any commodity so high as to be completely prohibitive, that commodity would not appear among its imports, and the duty in question would likewise necessarily be excluded from the calculation.

The proposal that the various national lists should be composed of the commodities actually consumed by each country is open to a similar objection. In this case any commodity subjected to a prohibitive duty and not produced in the country would be excluded from the list, and the duty would again necessarily be excluded from the calculation. Such extreme cases may be rare in fact, but since the theory that import or consumption lists should be employed is based on the idea that it is necessary to take account of the relative importance of each commodity to the economy of each country, it implies that the goods composing those lists should be "weighted" in accordance with the amount of each imported or consumed. Some such weighting is, in fact, always urged, and that perfectly logical suggestion brings out clearly the fallacy which underlies the whole

* *Op. cit.*, pp. 11-12.

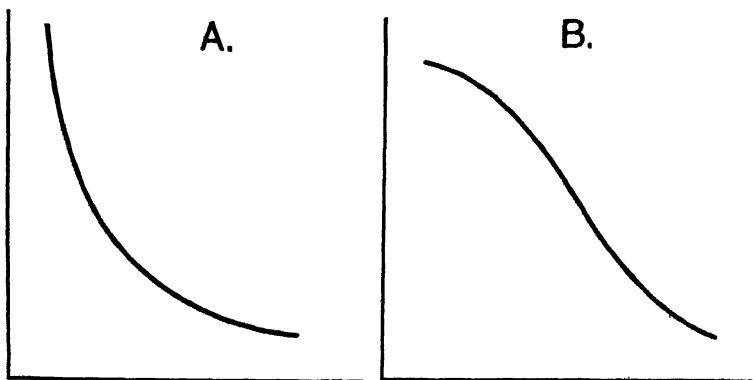
argument. The goods are to be selected and to be given importance in proportion to the demand for them—when that demand is itself largely determined by the duties which it is proposed to measure.

The reason why this particular theory can claim so many advocates is to be found, I think, in the fact that there is a general desire to measure by tariff indices the "degree of protection" enjoyed or achieved by different countries. This desire has given birth to the belief that existing indices have been computed in order to achieve this object or to the doctrine that, if they have not been so computed, they should be in future. All these desires, beliefs, and doctrines are, it seems to me, forlorn.

A strict disciple of the gospel of free trade might argue, wrongly or rightly, that the extent to which a country had effectively protected its industry might be measured in most cases by the extent to which it had reduced its international trade or flattened the trend of its growth by imposing duties; but I can imagine no other method by which the comparative degree of protection can be gauged.

The insuperable difficulties which such a measurement presents are obvious enough. There is clearly no reason to believe that because two countries show equal tariff indices (however they may be computed), they have protected their industries to an equal extent. The rate of duty which it is necessary to impose on the importation of any particular commodity in order to prevent that commodity being imported in the future will depend on the amount by which the price has to be raised in order either (a) to render the return on the application of given units of land, labour, and capital for the production of that commodity within the country in question equivalent to the return obtained on the production of other commodities (after the legislative change), or (b) to destroy domestic demand altogether when that demand succumbs at a price lower than that required to produce the conditions envisaged under (a). If we ignore for the moment the second alternative, then the rates of duty required in any given country to protect completely any selected list of commodities (or all commodities) will constitute a series, each item of which will be equal to the difference between the return to be obtained from the production of the particular commodity to which it applies and the return obtained from the production of some commodity which it is just more profitable to produce at home than to purchase abroad. These rates (or differences) for each individual country may be shown as a curve, the shape of which will depend in the first instance on the natural conditions and resources of the country, and in the second on its existing economic organisation. Thus it is obvious that the United States of America could make herself almost wholly self-sufficing by a series of rates of duty which, however measured,

would give a very much lower average than the rates which would be required by Italy to achieve a similar or comparable result. The one country is rich in minerals and has a large territory spreading over many degrees of latitude and many dissimilar climatic zones; the other is poor in mineral deposits and has throughout almost the whole of its area a temperate climate. We might imagine the curves of these two countries taking some such form as the following:—



Both curves are intended to represent the scale of minimum duties required to prevent the importation of the goods on which these duties are imposed. The average of the ordinates of curve B— which gives the scale for a country where the differences on the returns from the activities considered are naturally great—is obviously far higher than is the average of the ordinates of curve A. But *ex hypothesi* they are equally “protective.”

The rate of duty required in order to prevent the importation of goods which cannot be produced in the country imposing them is similarly dependent on fortuitous circumstances. It will be very high when the commodity or commodities in question are of vital importance to the industry or agriculture of the country in question; it will, other things being equal, be higher in the case of a rich than of a poor country.

A German writer* has recently suggested that the difficulty of measuring the “degree of protection” might be overcome if distinction is made between what he calls *ausnutzbare* und *nicht-ausnutzbare* Zollen (fully utilizable or not fully utilizable duties). He considers that a duty is not fully utilizable, if (a) in the case of a non-cartelized industry there is an export surplus, for in such a case the domestic price is determined by world conditions, or (b) there is an import surplus. He considers that a duty is fully utilizable when the

* Dr. Friedrich Lütz in the *Magazin der Wirtschaft*, August 2, 1929.

industry is cartelized and there is an export surplus. But neither the average of the *ausnutzbare* nor that of the *nichtausnutzbare* rates will help to measure the "degree of protection" (*der Grad des Protectionismus*) which appears to be the author's object. The *ausnutzbare* rates cannot, because as they are *ex hypothesi* absolutely effective it is quite immaterial if their average is 10 or 100 or 1,000. If the average of these rates for two countries were 10 and 20 respectively and the rates yielding the lower average were all doubled, the "degree of protection" would remain unchanged. The *nichtausnutzbare* rates cannot perform the miracle desired for the reasons I have already given. No, "degree of protection" is a will-o'-the-wisp which has already lured too many writers on this subject into its wordy swamps.

It is interesting in this connection to recall that attention was drawn to the danger of presuming that tariff indices measured the degree of protection so long ago as 1904 in the note on the comparative incidence of foreign and colonial import tariffs to which I have already referred.

"It would not, however, be justifiable to conclude from the above figures that the customs tariffs of the various countries are ranged in the same order as regards their comparative *protective efficiency*. The protective effect of a tariff is not necessarily proportionate to the average level of the duties, but also depends on many other factors, such as the comparatively advanced or backward state of the home industries protected."*

If this line of temptation be abandoned, then, as I think it should be, it is necessary to visualize the problem from the standpoint of the exporting country or countries and not from that of the "protected." If, secondly, the enquiry is to be international in its scope, the list of commodities must be composed of the exports of certain selected countries—or of all countries.

But before turning to a consideration of that list there is one vital question which we must face. I have argued that the tariff index cannot measure the comparative degree of protection imposed by this country or by that because the effectiveness of a duty depends on the economic structure of a country. Equal duties may have unequal effects. But a duty is protective when it prevents foreign goods entering the country which imposes it. If, then, the index cannot measure the comparative degree of protection, what can it measure? Can it measure the comparative degree of obstruction? It is probable that the index will reflect the degree of obstruction more accurately than the degree of protection, because duties, even when they are not high enough to prevent the competition of foreign goods

* Second Series, Cd. 2337 of 1905.

in domestic markets, will obstruct trade by raising price and limiting demand. Obstruction precedes protection, and practically all duties involve some obstruction. But when the duty is sufficiently high not only to affect demand but to protect, then the obstruction is suddenly magnified, and, as we have seen, the point (or the loci of the points) at which such conditions will arise must vary from country to country. Although, therefore the index may reflect better the comparative degree of obstruction, it cannot measure it with any great precision; it cannot do more than give a rough indication of the probable relative order of the magnitude of the obstruction created. The greater the resemblance between the general economic structure of any two countries, the greater the confidence with which their indices may be compared.

When the comparison to be made is not in space but in time, then, of course, many of these difficulties and limitations to the utility of the index disappear. Unless some radical and unusual change has taken place in the economic structure of a country—owing, for instance, to the discovery of coal or other important natural source of wealth—it is probable that a rise or fall in the index of its tariff level will coincide fairly closely with an increase or decrease in its degree of protection. The time are likely to be more truly significant than the space indices.

A Sample List of Goods.

In practice, of course, a sample list must be compiled, and the selection of this sample presents appreciable difficulties. In the Memorandum on Tariff Level Indices two different systems were employed. Under the first of these a relatively brief list of 78 commodities of importance in international trade was drawn up with the help of the classification of goods for trade statistics agreed at the Brussels Conference of 1913. The second list was composite. Fourteen countries, some industrial, some agricultural, were first chosen. About 20 of the most important representative articles of export of each of these countries were then selected, so that the whole list consisted of approximately 280 commodities. In certain cases these commodities were of course identical, or almost identical. I shall explain the reasons for adopting two alternative systems when I come to the question of price quotations. There are, however, one or two points concerning these lists which should be touched on now.

The average duty for any country will depend obviously both on the average rate and on the number of commodities subjected to duty. But the number of dutiable goods varies greatly from country to country. If, therefore, the sample list does not comprise all the commodities taxed in that country which imposes the greatest

number of duties, the index obtained for it will be somewhat low in comparison with that of any country all of whose dutiable goods are included. Reciprocally, the index of any country imposing few duties will be too high. This difficulty renders the application of any system of measurement in the case of a country imposing few but very high duties extraordinarily difficult—if not impossible. It is doubtful, for instance, whether the tariff of the United Kingdom, with its schedule of less than 250 items, could by any device be compared with, let us say, that of countries which can boast over several thousands of items.

The fact that a sample is employed at all involves, of course, the corollary that the indices do not indicate the average duty on all goods. As is stated in the report of the Committee on Industry and Trade, "the figures have no meaning in themselves, and are purely relative. No one figure can give an absolute indication of the level of a country's tariff."* But, on the other hand, the exclusion of commodities which are free from duties in all countries or in all the countries considered will have no influence at all on the comparability of the indices, and their inclusion could only be defended on the incorrect assumption that a figure could give an absolute indication of the level of a country's tariff. It is for this reason that I stated above that some paring of the complete list was justifiable, quite apart from considerations of convenience.

The method of compiling the sample list by taking the leading exports from certain selected States is open to the objection that it is difficult to apply the whole of that list in measuring the tariffs of those countries selected for this purpose. Thus, there are strong reasons for omitting the exports of the United States from the list when the tariff of that country is being measured, because the prices employed for them are United States export values. If this omission is made the sample employed is not uniform. In practice, if the sample is sufficiently large, the omission of a small fraction of it is not likely to have any considerable effect, provided the trade statistics of all the countries are reasonably valued. But cases might well arise in which a significant change of the index would result.

The danger of error on this account is greatest when the tariff of a country is being measured whose export valuations are abnormally high or low. The omission of its own export list in such a case may render its index incomparable with those for other countries. It may, indeed, be better when danger of error arising on this account occurs, to make two calculations, one including and the other excluding the measured country's export list.

Secondly, this system of constructing the sample list cannot, of

* *Survey of Overseas Markets*, p. 544.

course, be applied mechanically. Its advantage lies in the fact that, as I will explain later, it presents a partial solution of the extremely difficult problem of price quotations. But the total composite list must be a representative sample of the whole catena of goods composing world trade, and the selection made for each country must be rendered dependent on this final objective. This latter obligation implies that certain export countries not responsible for a very large share of world trade, but important as being the main sources of supply of some particular commodity, should be included in the list of export countries.

A problem really prior to any of those which I have mentioned immediately above is that of the definition of the term commodity. A price quotation should strictly refer only to individual entities or to goods so identical in character that they can be substituted for one another without any claim arising for extra charge or rebate. Such goods are normally sold by sample or according to specification. Tariff schedules, on the other hand, are never so detailed as to specify rates for all goods so defined. In the marrying of the goods selected with the tariffs various possibilities arise. The list of commodities may be confined to goods which can be sold by sample. If this is done it is only necessary to ascertain into what group of the tariff schedule each commodity falls. But in practice this procedure involves insuperable difficulties; for, if the list is not to be almost wholly confined to raw materials and semi-finished products, it must either be of quite unwieldy length or a specific commodity must be found which is truly representative of the group covered by the tariff schedule. The selection of "typical commodities" demands very great discrimination and technical knowledge, and, when these qualifications can be found combined, either the typical commodity or a price quotation for it is likely to prove undiscoverable for groups of any size. In consequence the list is likely to be unduly extended in length and to be made dependent on the chance existence of a market quotation rather than on the representative character of the goods composing it. From this it must not be understood that a list composed wholly of specific commodities as defined above would not give the most precise results if price quotations were always available and the amount of work entailed was a matter of no concern. On the contrary, it is probably the best theoretical ideal. But with the existing available data the practical approach to the ideal is so remote that other methods are to be preferred.

An alternative procedure, and that adopted in the League of Nations memorandum, is to take in many cases not single commodities as defined above, but small groups, and to employ for each group the average import or export value per unit. This method

postulates, of course, at once a characteristic homogeneity and, if measurement in time be attempted, a normal average composition of the groups. Further, the groups should be so selected as to coincide to the greatest possible extent with those shown in the tariff schedules. Exact coincidence can, however, obviously not be attained in all cases, and the marriage settlements thus demand very careful deliberation.

Prices.

The considerations which must determine the prices at which the goods should be valued are to some extent similar to those which determine the character of the sample list of commodities. Many writers urge that the import values of the country whose tariff is being measured should in all cases be employed. There are certain obvious advantages which tell in favour of such a procedure. The difficulty of marrying the commodity to the rate is greatly lessened, since the classification of goods in most trade statistics is based on the tariff classification. The price in question is normally approximately that on which the duty is actually imposed when that duty is *ad valorem*, and in the great majority of cases includes, as it should include for this purpose, cost of transport and freight to the frontier of the importing country. These are advantages of a practical order which it would be absurd to overlook. On the other hand, strong and, I personally consider, overwhelming theoretical arguments against import values can legitimately be raised.

No values will exist for goods on which so high a duty is imposed as totally to prohibit import. But more serious than this, because more general in its application, is the objection that the import prices themselves will be influenced by the rates of duty. Obviously, if such values are employed, they must refer not to a single uniquely definable commodity, but to such groups as the import statistics or the tariff schedule show. When rates are specific, then the average (not the aggregate) value of the imported goods in any tariff group is likely to be higher than would have been the case had no duty existed or had the duty been *ad valorem*. Thus a specific duty on wine will keep out the lowest qualities falling under any rate. When the statistical group covers two or more tariff items, the ratio of the import values to the prices which would have ruled under conditions of free trade will be determined by the *ad valorem* relationship of these rates. But as a general rule it may be presumed that specific duties tend to raise the average value of the goods imported which fall within any rubric of the tariff schedule. Apart from this point the prices at which identical goods are imported into different countries are likely to be influenced by the tariffs. An

exporter may be willing to accept a lower price in one market than another in order to maintain a required optimum of production, and the rates he quotes will in part be determined by the relative height of the barriers he is forced to surmount. Thus, import values will vary from country to country so that the international comparability of the indices is rendered defective. Import values, moreover, though they obviate certain practical difficulties, do not by any means remove them all. The sample list of commodities applied to all countries must be compiled either without consideration of import classification, or on the basis of the import statistics of a considerable number of independent countries. Since the classification of import statistics varies widely from country to country, the fitting of all the articles or groups thereof contained in this list to the various national import statistics in order to ascertain values would prove by no means easy. It pushes back the difficulty of linking the duties to prices one stage, and adds the new and in certain cases insuperable difficulty of determining value when the duty is so high as to be almost or wholly prohibitive.

If import values are rejected for these reasons, there remain for choice either market prices or export prices or values. In 1901 the British Government and in 1925 the authors of the *Survey of Overseas Markets* employed the last of these three choices. In the second of the two systems applied by the League of Nations the export values of each of the 20 selected countries of export were likewise used. The Austrian Committee of the International Chamber of Commerce, on the other hand, in the study * which they made in 1927 of average duties on Austrian goods, employed export price quotations furnished by leading merchants and manufacturers. They criticized both import and export values on the grounds that the trade statistics were not sufficiently accurate. Their procedure involved, of course, the choice of specific commodities and not small groups, and it is not surprising in these circumstances to learn that the Committee found in the course of their work that it was necessary to raise the initial list of 160 commodities to 402. In cases where accurate information can be obtained in this way direct from the business firms engaged in the trade there is much to be said in favour of the Austrian method. But it would be extremely difficult, if not impossible, to apply it to an international enquiry. It is no doubt true that the export values published in the national trade returns are frequently of doubtful accuracy. But where the scope of the enquiry is sufficiently wide the danger of serious inaccuracies in the final result can be largely circumvented. In the first place, if the list of commodities is long enough and a miscellaneous group of export countries

* *Zollhohe und Warenwerte*, Wien, 1927.

is selected, errors may be expected to cancel each other out to a large extent. There are no grounds for suspecting a constant bias in the data in any one direction—except in the case of countries in which an exchange control exists. Exchange control normally leads to an understatement of the value of exports. But such understatement is of no particular importance so long as it persists, since it will simply result in all indices working out somewhat and equally higher, and the absolute height of the indices is without significance. It is probable, however, that when the exchange control is abolished, exports will be valued more highly and, if measurement over a period of time is contemplated, countries with burdensome exchange regulations should be excluded from those whose export values are calculated.

In any case the list of commodities should be long enough to allow the law of error fair play. But that law must not be used as a patent medicine or a faith cure, and the selection of values requires very great care and expert knowledge. With the increasing use of declared values—even for exports—and the more serious study, criticism, and, therefore, control of trade statistics in recent years, it is not, I believe, impossible to make a selection of countries whose export values, at any rate for recent post-war years, may be employed with a reasonable degree of confidence. The danger of the comparability of the indices being influenced by possible error in the valuations of any export country is obviously greatly reduced if the list is common to all countries whose tariffs are being measured, and the weights employed, if any, are likewise constant or only varied from year to year and not from area to area.

The enquiry conducted by the League of Nations showed clearly that it was imperative to check the values of one country with those of others—of one year with those of other years—in order to discover cases of error or of an abnormal composition of some statistical class. In consequence, it is not possible to compile a list of commodities on abstract principles alone and then calculate prices. The first attempted list will certainly be found to require modification and adaptation during the progress of the enquiry. In view of the risk of inaccurate valuation in subsequent years the list of goods must be sufficiently long to permit the omission of one or two items, should that prove necessary, without seriously influencing the general average. It is perhaps desirable at this point to draw attention to the fact that abnormal prices due to currency depreciation do not impair the value of the indices. They tend to raise the ad valorem value of specific duties and, when the currencies in question have been stabilized, the calculated ad valorem duties will fall. These fluctuations of duty are factual, not erroneous.

The use of export values is sometimes attacked on the grounds that they are normally calculated f.o.b., while duties are imposed as a rule on the values c.i.f. to import frontier. This criticism is legitimate, if only one country of export is considered—and it is probable that the indices of the countries in closest proximity to it will stand relatively somewhat too low. But the difficulty can be very largely overcome in an international calculation by selecting export countries far distant from one another. There is thus a special advantage in composing the list of commodities out of a series of shorter national lists. But the majority of the export countries will probably be European, with the consequence that the tariff indices for European countries may lie slightly too low compared with those of extra-European countries.

The last theoretical possibility which remains for consideration is to employ not export prices or values, but market quotations either in one place or in a number of independent markets. Were this done, use might be made to some extent of the figures already collected for the compilation of wholesale price indices. But the available quotations for manufactured commodities are still too few to render this source of information of much value, and to construct an international tariff index from individual price quotations is unfortunately not feasible to-day. If, with the gradual improvement and extension of price statistics in the future, it ever becomes possible, great care will require to be taken not to employ quotations for the home market when these differ from those for export.

The Duties.

The first question which has to be settled in connection with the tariffs themselves is whether it is preferable to convert specific duties into ad valorem or vice versa. Since the great majority of duties to-day are specific, the latter alternative can claim distinct practical advantages, and we shall only be concerned with the prices of those goods on which ad valorem duties are imposed. If specific duties are employed, the average constituting the index will be an amount; if ad valorem duties, it will be a rate. As neither the amount nor the rate has any significance except by comparison with other amounts or rates referring to different countries or different dates, this distinction is immaterial.

The average of specific rates might well be employed for simple international comparison in a given year; but it is defective, if used as a time index, because it is uninfluenced by price changes. If a commodity is taxed at £20 per ton and sells in a given year at £100, and in the next year at £200 per ton, the rate of duty has fallen from 20 per cent. to 10 per cent. without any legislative change.

With the fall in the rate the degree of obstruction to international trade is diminished—unless both rates are totally prohibitive. A general rise in world prices tends to reduce all specific tariff indices, computed as rates, and a general fall to augment them, so long as those indices refer to countries with stable currencies. The conversion of specific duties to ad valorem is therefore necessary for all tariff indices intended to measure variations in time, except those deliberately devised to determine the effects of commercial legislation only. As a corollary of this, the prices employed for converting the ad valorem duties must be those ruling during the year in question and must be changed from year to year.

A second general question of much greater complexity relates to the action to be taken in the case of fiscal duties. The argument that fiscal duties should be omitted because they are not protective I do not think it is necessary for me to discuss. It implies a conception of the purpose of tariff indices which, for the reasons I have already explained, I believe to be erroneous. More serious is the argument that fiscal duties obstruct trade in a different manner and to a less extent than other duties. This is true only if all duties on commodities not produced in the taxing country as well as all import duties which are complemented by an equivalent excise are deemed to be fiscal. But, whenever a free-trade country imposes an elaborate protective tariff, or whenever the scope of a protective schedule is materially extended, instances are likely to be found of duties definitely protective in intent being placed on goods which at the moment are not manufactured in the taxing country. Further, when a single firm is protected and that firm goes bankrupt, according to this definition a duty may cease to be protective and become fiscal. Nor is it possible to confine fiscal duties to those which are imposed on goods which cannot be produced in the country in question or are supplemented by an excise; for in this case nearly all duties on tropical products which could be produced in temperate zones at a price would be excluded while, in fact, the majority are introduced for fiscal reasons. We are compelled, therefore, to employ, as the criterion for determining whether a duty is fiscal in nature or not, either the intention of the legislator or simply the existence or non-existence of a complementary excise duty. If fiscal duties be defined as all those which were imposed and are maintained primarily in order to increase the national revenue, then it is untrue that such duties necessarily obstruct trade in a manner different from other duties. It is untrue, first, because a duty which is primarily fiscal may at the same time be partially protective, and, secondly, because certain duties not imposed for fiscal reasons may exist on goods of which there is no domestic production.

If the judicious statistician declines to attempt to interpret the intention of the legislator, the practical issue limits itself to the question of the propriety of omitting those import duties which have a countervailing excise duty. Such duties clearly obstruct trade only to the extent to which the consequential rise in prices limits demand. But the same is true of all duties on goods not domestically produced. The only material difference between these classes lies in the fact that the demand for the goods subjected to import and excise duties is presumably inelastic, while no such probability can be postulated in the case of the other goods. The whole thesis in favour of omitting fiscal duties thus proves on analysis extremely difficult to substantiate.

I incline, however, myself to the view that it is wiser to omit goods from the list—such as tobacco and alcohol—which are normally taxed for purely fiscal purposes and are normally subjected either to excise duties or a government monopoly. I fully realize that most of the arguments commonly urged in defence of this procedure are open to the line of criticism I have just attempted to trace. But there remains always the essential residuum of fact, that the duties on a certain, not precisely definable, class of goods in the vast majority of countries are intended to produce the maximum possible revenue and are, therefore, designed to hinder trade to the least possible extent—and that, therefore, their inclusion in a tariff index is likely to lead to a misunderstanding and undue mistrust of the indices computed. When the specific object of the index is to measure the effect of tariff policy on trade—an object which, as I shall show later, requires a special implement of measure—then the case for omitting duties on this class of commodities is strengthened; for tariff policy is or should be distinct from fiscal policy. In fact, the two are frequently confused or the natural beauties of the former are prudishly covered in the decorous cloak of the latter. It is this confusion and this modesty which render the task of the statistician difficult, if not indiscreet.

The procedure adopted by the Austrian Committee of the International Chamber of Commerce in this connection is interesting. They consider as purely fiscal duties those imposed on goods which “could not be produced” by the importing countries in question (for instance, tropical goods in European countries), and calculate two indices, the one including and the other excluding such duties. When, however, a “consumption tax”* is imposed in addition to the import duty, the rate of that tax has been deducted from the duty and only the difference, if any, employed for the calculation of

* Presumably only countervailing excise duties; but the point is not quite clear. See *Zollhöhe und Warenwerte*, Wien, 1927.

the average. Strict logic would appear to have demanded that two calculations should have been made also in such cases, the one including the whole duty and the other only these calculated differences. The exclusion of fiscal duties as defined above and the deduction of internal commodity taxes from the import duties are justified on the same grounds, namely, either that all such duties are fiscal in intent or that their effect on demand is different from that of other duties. The deduction of consumption taxes, however, involves very great practical difficulties.

The third major problem which has to be faced in connection with the duties is that of the choice of data when identical commodities are subjected by any country to varying rates according to their place of origin. In the case of a national index it is necessary to take account of the fact that, when conventional rates are applied to only part of the exports of the country in question, it will be necessary so to construct the list of exports as to arrive at an average rate for all the goods selected which approximates closely to the average rate on all exports. But in computing an international index account must likewise be taken of the necessity of selecting a list of export countries such that the averages of the average rates for each one of them are representative of each measured country's average for the world. In other words, the conventions, the results of which are taken into consideration, should be a fair sample of all the conventions concluded by the country whose tariff is being measured.

These two principles, which it is impossible to neglect, are rendered all the more difficult of application owing to the multiplicity of tariff systems in existence. The unique autonomous tariff presents no problem. The autonomous tariff liable to retaliatory increase or conventional reductions involves both the problem of average rates for each export country and that of averaging the averages. The pure double tariff system presents the advantage that maximum and minimum indices may be computed and employed at least for purposes of checking; but when intermediate duties exist or the minimum schedule may be subjected to further conventional reductions it possesses no statistical advantages. Preferential duties have the effect of converting the minimum schedule, where that exists, into an intermediate tariff; but involve a special complication, inasmuch as they are outside the scope of the application of the most-favoured-nation clause. The existence of the most-favoured-nation clause of course enormously facilitates the work of determining what rates are applied in any particular case. But even that clause is sometimes partial in its application.

Whatever solution of this problem of averages is adopted, it is, I think, useful to calculate additional indices showing the maximum

and minimum tariffs when a dual system is in force. These additional indices show the range within which the average must fall and, when compared with the weighted average, the extent to which conventional reductions from the maximum have been effected. When this is done, however, a clear distinction should be drawn between the preferential minimum and that to which the most-favoured-nation clause applies.

The averaging of the duties on the exports of each country in the case of an international index is rendered difficult by the necessary limitations on the length of the national export lists. On the other hand, the averaging of these averages for the majority of these countries is less likely to involve error than might at first be believed, since 10 countries account for over 60 per cent. of the world's trade and 20 for approximately 80 per cent. A list of between 10 and 20 export countries, selected in the light of the considerations I have already emphasized, should therefore be adequate for the purposes of calculating indices intended only to present approximate relative orders of magnitude.

Such a list should constitute a fair sample of the world commercial treaty situation, when the primary consideration is world trade and not the extent or multiplicity of international conventions.

Careful consideration requires to be given to the means by which the list of commodities may be made a fair sample (for each country whose tariff is being measured) of the extent to which the autonomous rates have been effectively reduced by commercial conventions. If a weighted index for a single country of export, X , is being computed, the list must be such that the average of the new conventional rates on the commodities contained therein bears a ratio to the average of the autonomous rates on those commodities which is the same as the ratio of the comparable averages on all the commodities exported by country X . If, however, a unique list of commodities is employed for all countries the tariffs of which are being measured, it is improbable that these ratios will coincide— that the sample will prove adequate in every case. The greater the length of the list the less the risk of inaccuracy on this account. In the case of an international index, however, the selection of representative countries of export and, for each country, of a sample list adequate to assure a rough coincidence between the ratios mentioned above, does not necessarily wholly solve the problem.

The difficulty which presents itself is similar to that which arises in the compilation of national index-numbers of retail prices. The retail prices of a single commodity may vary from town to town. The rate of duty on a single commodity in the same place may vary according to the origin of that commodity. The compilers of retail

price index-numbers calculate either separate indices for a number of towns and average them or average prices derived from a number of different markets. If the former system were applied to an index of tariff levels, the list of goods for each country of export would have to be adequate not only for the purposes of contributing towards a composite international list, but for the compilation of a series of national indices. If the latter system were applied it would be at any rate theoretically desirable to weight the rates according to the relative production (or exports) of each producing (or exporting) country in the world. In practice, however, it is probable that a sufficiently accurate result can be reached without engaging upon any such elaborate research and calculation, provided adequate care is taken on three essential points. (1) The countries of export must be representative of world trade and cover an adequate proportion of the total; (2) the list of goods must be a fair sample of all goods composing world exports; and (3) the list for each country must be compiled not only with a view to constructing an adequate total list, but also with a view to obtaining fair average rates of duty in the case of countries with conventional tariffs. This final consideration may result in giving undue weight to certain commodities quoted in several lists in order to permit of the employment of varying rates. When this is the case, then the rates must be averaged and only the average employed in the final calculation.

I say sufficiently accurate results can probably thus be reached, and you may well ask, sufficient for what? This question I shall endeavour to answer at the end of the paper when we are in a position to review the various limitations to the accuracy of an international index of tariff levels.

Once the lists, prices, and rates have been determined there remains the question of marriage. Here two general problems of a different order, though closely allied in practice, present themselves. The first is one of interpretation, the second of compatibility or incompatibility of definition. Even when there is, in fact, absolute compatibility of the terminology employed by different countries, the task of deciding which commodity or small group of commodities in the export statistics of one country is represented by a given tariff number in the customs schedule of another is one for which expert knowledge is required. Very frequently absolute compatibility of classification is lacking. There are then three possibilities— that the tariff schedule grouping covers a wider range of goods or qualities than does the trade statistical grouping, that it covers a narrower range, or that groups overlap and cut across each other. The first possibility presents no difficulties, for the rate to apply to the part is the rate indicated for the whole. The second demands

great judgment and careful discrimination on the part of the compiler of the index. Let us assume by way of illustration that one of the export commodities selected is undyed cotton piece goods, and that these are grouped together in a single export rubric by one country and taxed at varying rates according to weight per square metre in another. There will then be as many rates of duty as there are defined qualities of fabric. What rate should be applied? There is a strong temptation to employ an average of the rates weighted in proportion to the imports or the consumption of the different grades of the goods in the country whose tariff is being measured, on the grounds that this average is the most "characteristic." But a little thought will make it clear that this temptation should be resisted, for it involves just that error of endeavouring to measure the degree of protection which I have been discussing. The extent to which the different grades are imported is itself largely influenced by the relative height of the different rates. It would, therefore, be more correct to weight the rates in proportion to the importance of the different grades in world trade. The practical application of this principle is, however, owing to absence of adequate data, frequently extremely difficult. The determination of the rate is a matter of judgment and clearly demands expert knowledge of the trade in the goods considered.

When the statistical and tariff classifications overlap so that half of one statistical group is contained in one tariff heading and half in another, an adequate solution of the problem is by no means easy to find. The seriousness of the difficulty in practice depends on the extent to which the rates of duty on the two or more groups of goods which cannot be accurately distributed vary from one another. If the rates of duty on these goods are almost identical, the margin of error must be small; if they vary greatly, the error may be considerable. Again, the only practical solution in such cases is to ascertain from the customs authorities of the two countries the exact composition of the groups in question.

The greater the precision of the export list, the greater the extent to which it is composed of individual commodities, the less the risk of error on this account. But quite apart from considerations of time and expense, the existing trade statistics set a limit to the detail which can be employed, and this problem of marrying rates and prices will be found in practice to be the one which presents by far the greatest difficulties. There is, in fact, only one method of solving it, namely, by engaging for the computation of the index specialists in this branch of knowledge. This was the plan adopted by the League of Nations, which employed a special temporary staff of customs officials or employees of Chambers of Commerce for the work.

Such a staff must necessarily be drawn from a number of different countries and must consist of persons who are themselves normally in daily touch with this class of question. I am of the opinion that some such procedure as this is indispensable for the compilation of an international index, and that the required knowledge could not be found either in a single government administration or in an international permanent staff normally engaged on other problems.

There is one further point concerning the duties which requires attention. If the specific duties are converted into ad valorem rates, then it would seem natural to employ such ad valorem duties as exist without further scrutiny. It is pointed out, however, in the extremely valuable observations to the League of Nations Memorandum on Tariff Levels* submitted by M. Di Nola, that an x per cent. duty in any two countries may be in practice dissimilar. As this authority states, various criteria are adopted for determining prices for the purpose of the application of ad valorem duties. "It is a well-known fact that, as the result of the application of certain of these criteria, the incidence of the duty may be found in practice to be much higher than that indicated by the percentage named in the tariff. If, for example, a 10 per cent. duty is levied on a certain pharmaceutical product, but is levied not on the basis of the original wholesale price—perhaps with the addition of cost of carriage, etc. (taking this price as 100)—but on the basis of the retail price at which the product is sold in the importing country (taking this price as, say, 150), it is obvious that the incidence of the duty, considered from the point of view of a country applying the first system in such cases, is 15 and not 10 per cent."

In fact the basis of assessment in the case of ad valorem duties cannot well be ignored.

Weighting and Average.

The questions of weights and the form of average which should be employed may with advantage be considered together. As I shall endeavour to make clear, use may be made either of quantity or of value weights according to the results at which it is intended to arrive. The form of average will likewise depend on the object in view and on the character of the weights selected.

According to the general conception of a tariff index which I have been elaborating, the correct theoretical value weights should be proportionate either to the relative value of the world production of each commodity or of the world trade in each commodity.

The first alternative may be defended on the grounds that the world trade in any commodity may be limited by the existence of

* *Op. cit.*, p. 33.

tariffs. (I do not propose to run the risk of falling into the slough of the free-trade controversy by discussing the extent to which tariffs actually curtail or promote trade. But all parties will agree that they have some influence.)

The argument that trade is influenced by tariffs, though valid, is, I think, pushed too far if employed not only as a criticism against weighting by trade values, but as a ground for weighting by production ratios. The theoretically perfect weighting system would be one under which each commodity were given a coefficient equivalent to the value which it would have in the international trade of a free trade world. To employ production coefficients would seem to postulate that all the goods produced domestically are not only potential exports, but would in an unbarred world be internationally exchanged. Such a hypothesis is demonstrably false. Further, in a free trade world, not only the composition of world trade but the relative quantities and values of goods produced would be different from what they are to-day. In practice the suggestion has little interest, as the data for estimating the world production of all the goods entering into international trade, or for estimating that of any adequate sample of that totality, are obviously lacking. We are forced, therefore, inevitably to employ world trade weights. World trade weights are no doubt defective owing to the fact that the quantity of any particular commodity imported or exported in the world as a whole is influenced by the duties which are imposed on it. But they are falsified by this cause to a much less extent than are weights based on the relative quantities of the imports of each country whose tariff is being measured. Import weights of this sort are frequently recommended on the grounds that it is necessary to take into account the "relative importance of each commodity to the economy of each State." But it is obvious that the quantities of each commodity imported into any country will tend to vary from the quantities which would have been imported had no duties been imposed in direct relationship, if not to the height, then to the effectiveness of the duties imposed, until a point is reached at which the duty is prohibitive. (Any raising of rates above prohibition point will, of course, have no effect.) National import weights are therefore falsified to the maximum possible extent by the tariff schedules. World export weights, on the other hand, are influenced by the average of all duties existing in the world and are not directly dependent on the particular rates which exist in the country whose tariff is being measured. Import weights are, further, open to the objection which I raised above to any attempt to measure the extent to which tariffs are protective.

The proposal to weight not by imports but by national con-

sumption is based on the confused ideas that the degree of protection can be measured, and that the weights should be proportionate to the relative importance of each commodity to the national economy. The criterion of relative importance to national economy is only significant if the object in view is to measure the degree of protection, and, even if it were possible to measure the degree of protection, only by a violent assumption could relative importance be gauged. The consumption of some commodity of primary importance to the national dividend of a country may be curtailed by the existence of a high duty.

There is, however, a slightly different line of argument which requires consideration. It runs, if I rightly comprehend it, as follows. The utilization of export lists and export weights may for certain countries involve a system of measurement which, however theoretically justifiable, is too far divorced from reality to have any significance. The imports of certain countries are so specialized that to consider duties on them in relationship with the whole catena of commodities constituting world trade is ridiculous. Put in this way the argument appears to me to be sound. There are certain extreme variations from the normal which must be excluded from consideration. An act of judgment is required in determining what countries should be classed in the category of economic "sports" or amoebæ, and countries with very high rates of duties may sometimes find this act of judgment embarrassing. But it ceases to be serious when pushed beyond this point, when it is contended that certain duties in the tariff schedules of most countries are of no relevance, as the goods on which they are imposed are, in fact, never purchased, and that for this reason any attempt to measure tariffs must prove vain. By analogy we might argue that indices of retail prices are impossible because fresh eggs are sometimes rotten. In practice we must take as granted both the average ineptitude of human legislation and the average dishonesty of the domestic fowl.

The actual determination of world export weights involves great practical difficulties, and would involve, if perfectly accurate results were demanded, a calculation of the aggregate value of the world exports of all the commodities in the sample list. For a number of the staple commodities calculations of this sort already exist, but in other cases resort must be had to estimates and approximations. The risk of error in making such estimates must be acknowledged; but errors in weights are as a rule of relatively minor importance, and the greater mistakes in the weights for tariff indices are likely to occur in the case of the lesser and not of the major weights.

If quantity weights are employed, more precise results may be expected. The accuracy of the trade statistics in recording the

quantities of imports and exports at any rate of stable commodities is probably greater than is generally believed. In a study which I made recently of approximately the total world imports and exports of seven raw materials and food-stuffs, I found that in the year in question only in the case of cotton did the aggregate of imports differ from the aggregate of exports by an amount which exceeded the maximum error which might have arisen from the fact that the enquiry did not comprise certain statistical areas of minor importance. Detailed statistics of this sort can, owing to differences in classification, only be elaborated for staple commodities, and the labour involved is very great. In the League of Nations memorandum, which had to be produced within a fixed period of time, a detailed analysis of the trade statistics of the world was not attempted. Two series of very rough weights were used. The first was equivalent to the relative importance in terms of value of each commodity to the exports of the countries from whose export statistics they were extracted. A further calculation was then made under which "the weighted indices obtained from the goods selected for each export country were themselves weighted with factors whose importance was proportionate to the relative aggregate values of the total exports of the various export countries." This system is obviously a makeshift, and the weights can scarcely have done more than prevented serious error from arising in the case of certain countries whose indices might have been affected by exceptional rates on one or two commodities of minor importance. The indices calculated by the League were finally grouped in classes with a 5 per cent. range (*i.e.* countries with indices over 25 per cent. from 20 to 25 per cent., from 15 to 20 per cent., etc.). In only one case did the employment of weights affect the group into which a country fell.

The practical importance of weighting must therefore not be exaggerated, and a sufficiently accurate result could probably be reached by a very careful compilation of the list of commodities, the repetition of certain goods, and the selection of a number of allied goods representing important groups.

Weights are, however, necessary if the object of the calculations is to show variations (in time) in the indices resulting only from legislative changes and to eliminate those which are the outcome of price movements. When this restricted object is visualized, quantitative and not value weights are required, and specific, not *ad valorem*, duties must be employed. Weighting is necessary if specific duties are averaged, because the unweighted duties are likely to be incommensurable. An average of £*x* per ton and £*y* per square metre obviously has no meaning.

If the object of the measurement is therefore merely to make

comparisons in space—of one country with another—at a given date, it would appear to be simplest to calculate the aggregate value of the duties which would be collected in each country on the total of the quantities of each commodity contained in the sample list. The formula would then be $\Sigma x_0 q_0 : \Sigma X_0 q_0$ when

$$\begin{aligned} x_0, x_1, x_2 \dots &= \text{the specific duties in country A and} \\ X_0, X_1, X_2 \dots &= \text{the specific duties in country B.} \end{aligned}$$

If comparisons in time are to be made and the price factor ignored, then with constant weights the formula for the time index will be the simple aggregative

$$\frac{\Sigma x_1 q_0}{\Sigma x_0 q_0}.$$

When a time index of this sort is proposed, existing ad valorem duties must be converted into their specific equivalents by means of an unvarying price schedule.

The above formula, it may be remarked in passing, gives results identical with those which would be obtained from employing absolute full value weights and ad valorem duties. For were this done the price factor would cancel out. Thus if x is the specific duty, p the price and q the quantity, then the ad valorem duty weighted by full values would be

$$\frac{x}{p} \times qp = xq.$$

If variable weights are preferred, the formula

$$\frac{\Sigma x_1 q_0}{\Sigma x_0 q_0} \times \frac{\Sigma x_1 q_1}{\Sigma x_0 q_1} \text{ or } \frac{\Sigma (q_0 + q_1) x_1}{\Sigma (q_0 + q_1) x_0}$$

can probably with advantage be employed.

I doubt, however, whether for time measurements this method of approach has much practical value to-day, except for measuring the tariff of a single country after an important legislative change. If the data available for use in the compilation of tariff indices manifested a high degree of accuracy and the scope of the enquiry could be extended so as to make full provision for conventional tariff reductions, then an annual measurement of the effect of legislative and contractual changes in tariffs might be valuable, and these changes could be suitably measured in the manner just indicated. But I personally very much doubt whether the data at our disposal to-day are adequate to record accurately minor fluctuations of this character. If they are inadequate, then proximate and frequent measurements would serve no useful purpose. If, on the other hand, tariffs are only measured at relatively long intervals of time, then, except in

periods of unusual price stability, the price factor cannot well be ignored. A rapid rise in prices is likely to induce the legislator to increase the specific rates of duty, and a rapid fall may lead to a reduction of rates or render unnecessary for the object in view an increase which would otherwise have been seriously considered. Since price changes affect the tariff levels when duties are specific to the same extent as rate changes, and at the same time have a direct influence on legislation, preference should, I think, be given to an instrument of measurement which is sensitive to them.

The effect of price changes can only be gauged by employing ad valorem rates and estimating the ad valorem incidence of specific duties by means of price schedules severally applicable to each year for which calculations are made. When this is done, since the ad valorem duties are ratios linked to a common percentage base, price, direct weighting is, as I have said, not indispensable. There are no concealed haphazard weights.

In the case of an index-number of, for instance, wholesale prices, it is customary to weight the price relatives by the full values. When this is done and an arithmetic mean is employed, the result is identical with that which would be derived from an aggregative index. The two processes of calculation are indeed essentially the same. In a tariff index, if the relatives of the rates were employed and not the rates themselves, then the weights should be proportionate to the total amount collected as duty on each commodity—*i.e.* (qx). But this form of calculation is identical with the employment of full value weights (*i.e.* qp) and the ad valorem duties. The formula for the first system is

$$\left(q_0 r_0 \frac{x_1}{p_1} \div \frac{x_0}{p_0}\right) + \left(q'_0 x_0 \frac{x'_1}{p'_1} \div \frac{x'_0}{p'_0}\right) \dots \div q_0 x_0 + q'_0 x'_0 \dots \dots$$

$$= \sum \frac{q_0 p_0 x_1}{p_1} \times \frac{1}{\sum q_0 x_0}.$$

The formula for the second is

$$\left(q_0 p_0 \frac{x_1}{p_1} + q'_0 p'_0 \frac{x'_1}{p'_1} \dots\right) \div \left(q_0 p_0 \frac{x_0}{p_0} + q'_0 p'_0 \frac{x'_0}{p'_0} \dots \dots\right)$$

which reduces to the first.

I do not think it is necessary to recapitulate here the well-worn arguments in favour of the various forms of average which might be used for the type of index now being considered. Owing to the nature of the data which must be employed in the calculations, however, a certain proportion of erratic results (rates) are certain to occur in the course of the work. Their effects can be lessened to some extent by utilizing, as one must utilize, a sufficiently compre-

hensive and detailed list of goods. But the use of the geometric mean or the median will help to minimize the danger of outside rates (factual or erroneous) having an undue influence on the average. A government may decide to impose some wholly exceptional rate on a particular commodity for special reasons of policy, and it is preferable that such exceptions should not be allowed unduly to affect the general "tariff level."

I believe I am correct in stating, however, that for all the tariff indices calculated up to now the arithmetic average has been employed.

General Conclusions.

I hope I have said nothing during the course of the evening which might give rise to the belief that a reasonably accurate measurement of tariff levels is easy to accomplish! Before I summarize the very tentative detailed conclusions which I desire to submit, I should like to recapitulate what appear to me to be the major difficulties and causes of possible error. These are all connected with the data which have to be employed and not with the theoretical problem itself. It is true that the form of measurement, the conception of the problem which I suggest, has proved to be alien to many minds and incomprehensible to others. But its incomprehensibility is due, I believe, not to any inherent obscurity, but to the common and, in my opinion, radically false assumption that a tariff index can and should measure the degree of protection afforded by governments and enjoyed by industry or agriculture. Owing to confusion of thought on this point, statesmen are fond of declaring that it is misleading to measure tariffs and ignore prohibitions. Equally reasonably might we maintain that a hydrometer should measure temperature and is useless if it fails to take account of air pressure.

But the practical limitations to successful measurement are very real. They may be summarized as follows:—(i) It is difficult to compile a list of commodities of manageable size which is at once a fair sample of all goods composing international trade and so related to the various countries of export as to represent adequately for each one of them the varying treatment to which their goods are subjected as a result of conventional and differential tariffs. (ii) It is still more difficult to attribute prices to these goods which are truly characteristic, in view of the facts, first, that the goods in question are in many cases necessarily small groups of allied products and not individual entities; secondly, that market quotations are generally unobtainable or unsuitable; and, thirdly, that the values recorded in trade statistics are often of doubtful accuracy. Permanent under-valuation or over-valuation in trade statistics is, however,

not necessarily of grave importance. (iii) The theoretical objections to import values are so strong that such values can only reasonably be employed as a check to results obtained by other methods. But owing to the predominant position held by European and North American countries in the trade of the world, the employment of export values is likely to exaggerate to some extent the indices of countries whose distance from these two centres exceeds the average. (iv) The trade statistical and tariff classification of countries vary so much that the conversion of specific duties into ad valorem rates or vice versa frequently presents problems of great intricacy, problems which can only be solved in the light of highly specialized knowledge. (v) Perfectly accurate determination of the weights to be employed is both impossible and unnecessary. But if an adequate list of goods is utilized, the amount of work involved in compiling even approximate weighting coefficients is likely to prove extremely heavy. (vi) The average for countries with very few duties will almost certainly prove to be too high relatively to those of countries with long tariff schedules.

This last difficulty sets limits to the scope of any enquiry into tariff levels. The others should determine the frequency with which measurements may suitably be made. These others can be overcome no doubt to a considerable extent by employing a very complete list of commodities and allowing the law of great numbers full play. But I am personally very doubtful whether, with the data available, tariff indices, however carefully elaborated, can be expected to do more than present a rough order of magnitude with a wide margin of error. If this view be correct, then too frequent measurements are likely to be misleading rather than enlightening. Nothing will be gained by measuring at intervals during which the real changes in tariff level are less than the probable error in the index. On the contrary, such a procedure, in addition to incurring the risk of mistaken findings, is likely to induce the public to believe that the index is characterized by a precision greater than it can actually claim.

Obviously no rule can be laid down as to the most suitable intervals to adopt. During periods of rapidly moving prices or of great legislative activity, relatively frequent enquiries may be justified. When any single country makes a complete and radical revision in its tariff, an attempt may be made to measure the effects at once. But I doubt whether the best instrument we can manufacture will prove sufficiently delicate to gauge accurately the minor changes resulting from the conclusion of bilateral or multilateral commercial treaties.

On all these points, however, I am most unwilling to dogmatize

and shall be happy to learn that others hold more optimistic views, if such in fact be the case.

As the various problems which I have been discussing this evening are closely interlaced, it has not been easy to keep the main thread of my argument constantly visible, and it may be well, therefore, to summarize the constructive proposals briefly and succinctly. In this summary I consider only points of major importance.

(I) In order to measure the general level of tariffs two processes are possible. A calculation may be made either (a) of the total amount which would be collected in duty in various countries or at various dates on a common list of selected commodities, or (b) of the average of the rates of the ad valorem duties which are imposed on those commodities. The first method brings out differences and variations resulting from commercial (and possibly fiscal) legislation and commercial treaties. The second method, since most tariffs are specific, indicates also the changes resulting from price fluctuations.

(II) All duties must be expressed under the first method as specific duties, under the second as ad valorem rates.

(III) In each case it is necessary to compile a list of commodities to which the duties are applied. In an international index the list may most suitably be so drawn up as to constitute a sample of the goods composing world trade.

(IV) The list must be common to all countries whose tariffs are being measured, and not varied (except possibly in minor details) from country to country. Were variation allowed, incomparable results would be obtained. Variation according to the imports of the country whose tariff is being measured, which is frequently proposed, is irrational, as those imports are largely determined by the tariff.

(V) Since world imports equal world exports, the sample list may be based in either. But in practice it may be found convenient to compose this sample by combining a series of shorter lists based on the exports of the more important exporting countries. If this system is adopted and trade values are employed, the danger of indices being rendered incomparable on account of the varying differences between f.o.b. and c.i.f. values is largely overcome.

(VI) If the sample list is constructed in this way, the export countries should be selected so as to be representative at once of the total of world trade and of the commercial treaty situation.

(VII) In the absence of more accurate price statistics, export values would appear to be the most suitable data to employ for the conversion of specific duties into ad valorem rates or vice versa.

(VIII) It is probably desirable to ignore altogether duties imposed for purely fiscal purposes on certain commodities, such as

tobacco and alcohol, normally subjected to excise duties or direct government control.

(IX) The system of weighting depends on the form of measurement. For the first method mentioned above, quantity weights must be employed; for the second, full value weights. The weights in both cases should be representative of the relative importance in world trade of the goods selected. If a sufficiently detailed list is employed, indirect weighting may prove adequate for the purposes of the second method of measurement.

(X) Owing to the character of the data employed and the possibility of exceptional "outside rates" throwing out the average, the geometric mean or median is to be preferred.

I have deliberately employed somewhat categorical language in the enumeration of these points in order to render the suggestions made clear and definite. They are not, however, intended to be more than suggestions of a tentative character, and they are subject to all the reservations and qualifications which I have mentioned already.

I repeat the words with which I opened—I do not come before you with a problem solved, but in search of light.

DISCUSSION ON MR. LOVEDAY'S PAPER.

SIR HUBERT LLEWELLYN SMITH: It gives me very great pleasure to move a cordial Vote of Thanks to Mr. Loveday for his admirable paper. I think that the predominant impression that will have been made on the minds of those who have listened to his summary, and still more on those who have had the opportunity of looking through his paper *in extenso*, will be one of deep satisfaction to find that the statistical problems connected with international commerce are being studied at Geneva under Mr. Loveday's guidance in a scientific spirit, and with the complete detachment from national prejudices which is so eminently exhibited in this paper. That, of course, is no news to me, as I have had the advantage of eight years at Geneva watching at close quarters the admirable work of Mr. Loveday and his colleagues of the Statistical Section of the Secretariat of the League of Nations. It is a great satisfaction to us all that the League has confided this important branch of its activities into hands so capable, so judicious and so impartial as those of Mr. Loveday.

My own personal interest in this problem is twofold. I was a member of the Preliminary Committee of the Geneva Conference which launched Mr. Loveday's recent enquiry, but my interest goes back a long way farther than that—back, in fact, more than twenty-

five years, to 1903 and 1904, when the Board of Trade first tackled the problem of measuring tariff levels. The problem we had to face was infinitely simpler than that which Mr. Loveday has to tackle, because we were only concerned with the national point of view—with the relative effect of tariffs of foreign countries on the trade of a single country—our own—and our object, as far as I can remember it over this lapse of time, was twofold: to locate the chief sinners in obstructing the flow of British exports, and to lay the foundation for future comparisons which would show whether tariff barriers were diminishing or increasing. We had a double idea of a space comparison and a time comparison.

It has been a great gratification to me that the reader of the paper should have made such a generous reference in his paper to that early pioneer work, and also to find that he has been led by irresistible reasoning to base his more complex survey on a generalisation of essentially the same principles as those which the Board of Trade followed in 1903-4, and which have more recently been followed by the Balfour Committee on Trade and Industry. I need hardly say, however, that I am in complete agreement with Mr. Loveday that the basic principles of the calculation are the only ones which can reasonably be expected to yield results of any scientific value, and that the commonly repeated criticism that this method fails to give adequate weight to the differences in relative importance of the different classes of commodities in the interior economy of the State whose tariff is being measured, is a wholly misconceived one, and shows a want of grasp of the true method and object of the calculations. But I may tell Mr. Loveday for his comfort, that twenty-five years ago I had to meet a storm of criticism of exactly the same type, not only from politicians, but from some economists. I can call to mind one distinguished foreign economist who was extremely perturbed by what he considered to be the injustice done to his country by the method pursued. I was more than consoled, however, by the immediate and whole-hearted support which we received by so great a master of the science of index-numbers as the late Professor Edgeworth.

I agree with Mr. Loveday that this method will not yield results which can be used for direct measurement of the comparative protective efficiency of tariffs. In fact, I gave reasons for that belief in the old Blue Book which Mr. Loveday has quoted, and nothing has induced me to alter that view. I am glad that he agrees, but I would not go so far as to say that the calculation makes no contribution towards solving that difficulty; in fact it clears up one important factor affecting protective efficiency. It does not, and cannot, make allowance for the other factors, which are of very considerable, although perhaps of minor, weight.

Thirdly, I am in entire agreement with Mr. Loveday that if an international tariff index is constructed on the time basis with a view to future repetition, to set up a chain of comparisons, the necessarily wide margin of possible error in the data indicates that the period between successive calculations ought to be a fairly long

one. I should prefer ten years to five, and hope that it will never be below five. Certainly it seems to me that an annual series of international tariff indices would be a delusion and a snare.

I do not want to enter into the very interesting detailed problems, both theoretical and practical, which Mr. Loveday has indicated in his paper as those which he has had to face. I have great confidence that he will solve each of these difficulties in a most judicious way, but I am going very rashly to throw out for Mr. Loveday's consideration a very tentative suggestion for a possible alternative mode of approach for the construction of an international tariff index which, while based on exactly the same principle, might possibly avoid or minimise some of the practical difficulties to which he calls attention in this paper. I am aware that the methods I am going to indicate would give rise to new difficulties of their own, but we should have to weigh and balance one against the other. I would also say that I have very little doubt that Mr. Loveday, who has given so much time and attention to this matter, has already thought of the suggestion I am going to make, and probably rejected it for very good reasons. The suggestion is this:—It is obvious from the paper that Mr. Loveday's chief practical difficulties arise in the process of converting what was originally a national tariff index into an international tariff index—that is to say, of making a method which was intended to measure the effect of tariffs on a single country into a method that will give some sort of measure of the effects of tariffs on trade in general. Would it not be an advantage to take that difficult step by two stages? If so, the first step would be to construct for each of the great exporting countries separately, national tariff indices on the same basis as those which have been employed for the measurement of tariff levels in relation to British trade; and then, as the second stage, you would combine these separate national indices by suitable weighting and assemble them into a single international index. There may be some insuperable difficulty of a practical or theoretical order to what I am suggesting, but, if not, it would have the incidental advantage of producing a very interesting and valuable by-product in the course of the calculation, because you would have a series of national tariff indices by comparison of which you could get some further light on the question of the repercussion of each tariff in turn on the trade of other countries separately, besides its effect on the export trade of the world in general.

This is only a very hasty and half-thought-out idea, but if it is my duty not only to move a Vote of Thanks to Mr. Loveday, but also to open the discussion, I thought I could not do better than throw down this suggestion to be torn to pieces by subsequent speakers.

I move a hearty Vote of Thanks to Mr. Loveday for his paper.

DR. SNOW : In seconding the Vote of Thanks to Mr. Loveday, I should like to associate myself first of all with the complimentary remarks made by Sir Hubert Llewellyn Smith on Mr. Loveday's work at the League of Nations and also on this paper. Mr. Loveday

has been engaged on this class of work for ten years and his output has been very great, but I think I am right in saying that this is the first contribution he has made to this Society during that time. I venture to hope that Mr. Loveday may make an annual contribution to the Society's *Journal*. The nature of his occupation and the character of his work certainly ensure that any contribution would be of high merit.

Most people hearing of the term "tariff" index for the first time will probably jump to the conclusion that it has reference to a fairly simple matter. They will remember the index of wholesale prices and the index of cost of living, and imagine that the difficulties in constructing a tariff index are not much greater than those associated with the other indices. The present paper, however, must convince us all that the difficulties which must be faced in trying to measure the average level of a series of tariff duties are of quite a different order from those involved in measuring, say, the average of a number of price movements.

I am reminded of an incident in the war. At one time the supply of wool for our Allies became critical, and the big-wigs had to have a conference about it. In the course of that conference one of the big-wigs turned to the wool expert and said, "What is the price of wool?" The wool expert said, "There are 137 grades of wool and the price ranges from 6d. to 10s. a pound." The big-wig turned round and said, "I have asked you a simple question and I want a plain answer." Many people in different countries have no doubt put to Mr. Loveday what they think is a *simple* question in asking what is the tariff level of this country or that. His paper, I think, shows clearly that a *plain* answer cannot be given to that question.

I think there is a danger that a "tariff index" will be used to try to answer too many questions. This is a matter in which it is really necessary to have a different index for different purposes. When comparing the tariff level of a particular country at different times, one form of index can be employed. But for comparing the tariff level in different countries at the same time, another index is more suitable. Most people who have referred to tariff indices have referred to them with the idea of the measurement of the extent of obstruction to trade. But the height of a boundary wall does not give an adequate idea of the extent of the protection it affords to those within it. The foot rule which may be used for measuring a wall is not the instrument for measuring the degree of protection given by the wall to the people inside, or the degree of obstruction which prevents the people outside from getting in. There is so much misunderstanding on this matter that I should like to refer to an actual illustration.

I noticed recently a report in a French paper of a meeting where the customs duties in France and abroad were being discussed. It was contended that France was one of the countries where protective duties were lowest. One speaker asserted that, contrary to what was believed in other countries, France was the most liberal of all

nations, and he quoted figures from the League of Nations Memorandum of 1927 to prove his view. In the list in that memorandum France comes quite low down with a general index of 12 per cent., the United States being 51 per cent. The figure for Great Britain was not given in the list, but in the report of the meeting a foot-note was attached to it with the comment that Great Britain had a safeguarding duty of $33\frac{1}{3}$ per cent. in a number of industries, and that this duty rendered the importation of various French goods into Great Britain extremely difficult. The impression created by the report was that the general protection accorded to industry in Great Britain was measured by an index of $33\frac{1}{3}$ per cent. in comparison with a corresponding index of 12 per cent. in France. This illustration shows the great danger of the use of "tariff indices" in unskilled hands, and until the experts are satisfied with the technical aspects of the matter there is much to be said for keeping this instrument out of the arena of polemics.

Mr. Loveday in his paper does not describe the most simple index of all, one which is referred to in the League of Nations Memorandum only in a cursory way and for the purpose of being dismissed as unsuitable, but which I consider to be worthy of further attention. It is simply this:—the whole value of imports and the amount which is raised by duties on those imports is taken, and the index is obtained by dividing the value of the duties raised by the value of the total imports. This is a very rough-and-ready way, but I think it is sufficient for comparing the relative tariff levels in one country at different dates. It is free from a good many of the troubles which are present in the method described by Mr. Loveday. I agree it is useless for comparing the tariff level of one country with another country at the same time, and for that purpose it may be necessary to use the more complicated method developed by Mr. Loveday. The chief remark I have to make in relation to that method is regarding the selection of commodities. Mr. Loveday has described fully how this is done, but I fear that method does not ensure that we are measuring the circumstances of a completely random sample of all commodities. Suppose we are comparing two countries, in both of which a thousand articles enter into the import trade, and that both countries have a duty on practically everything, and we select 75 articles for the purpose of measuring the average rate of duty. In that case we obtain two averages which are strictly comparable. But if we compare a country with a duty on almost every article with a country like our own which has a duty only on a few, and we take a selection of 75 in one case and 75 in the other, I am not sure that in so doing we are going to reach results which are properly comparable. It is not enough for the sample to be a random sample of the articles entering into foreign trade, but in the case of the first country it must be random as regards the goods on which a duty is imposed and those on which no duty is imposed. A list of goods selected in the manner shown by Mr. Loveday may, when applied to this country, be much more representative of the goods with a duty than it is of other goods, and I should be very

critical of any comparison of tariff indices in which this country is concerned for this very reason.

This is practically the only point on which I feel I can throw any light on Mr. Loveday's paper, and in consequence I am rather reminded of an observation which was made on Mr. Loveday's original memorandum when circulated to the League of Nations Committee. An Austrian member said, "This is a most excellent memorandum. It confirms the impression I have always had of the relative tariff indices of various countries." I would say of Mr. Loveday's paper, "This is a most excellent paper. It confirms my scepticism on the subject of tariff indices and of the danger of discussing tariff matters by means of such indices."

I should like to conclude by seconding the Vote of Thanks which has been proposed to Mr. Loveday for his most valuable paper.

SIR BASIL BLACKETT said that although he rose to continue the debate, he did so only in the hope of encouraging others to use their voices, as he had come to the meeting to listen and to seek light.

He had listened to Mr. Loveday's paper and to the two speakers who followed him, and the question that was uppermost in his mind was, For what purpose did one want to measure tariff levels? It seemed to him that everything depended upon the purpose in view in the method of measuring the tariff. Was the object to find out how heavily the tariff was bearing on the inhabitants of the country which had the tariff? If so, then the kind of index constructed on the basis suggested by the last speaker might be very valuable, viz. a figure showing the total amount of duty paid with reference to the total amount of commodities imported, and that, compared with conditions in the same country ten years before or after, would at least give a measure of the rate of indirect taxation subject to very careful arrangement and weighting with reference to those duties which were not protective duties, but had a corresponding excise duty from the country within.

If one wanted to know the comparative level of the duties imposed by France on the imports she received and the duties imposed by this country, there would at once be very great difficulty. The illustration already given showed that it was quite possible to show that Great Britain had a much heavier protective level of taxation than France. If one wanted to know the comparison between the weight of import duties on the exports of one country as compared with another, there was a still different purpose in view which required a still different index. What an index of the weight of tariffs on all the exports of the world might mean he failed to understand at all. What was it that was being measured? No doubt it would be possible to give the amount raised by import duties and export duties in all the world statistically, and to find what relation that figure bore to the c.i.f. or f.o.b. values of all the exports of the world, but would one be very much wiser? For this reason he, like Mr. Loveday, sought for light. Sir Basil said he would like to know

exactly what was the purpose that Mr. Loveday had in view in seeking to measure the level of tariffs? It was a subject on which he would like to hear the opinion of others, and for this reason he would conclude his intrusion with a word of thanks to Mr. Loveday for the very excellent paper which he had contributed to the Society.

MR. A. D. WEBB said that with regard to the question put by Sir Basil Blackett one answer would be that some numerical measure was wanted of those tariff walls on the map which Sir Clive Morrison-Bell had been taking round Europe.

Mr. Webb said his object was not to discuss the general question of the desirability of calculating an index which would measure tariff obstruction, but to raise a point of criticism in regard to one or two of the factors which entered into such a calculation. On pages 501 and 502 Mr. Loveday entered into a brief but admirable discussion of the reason why what he called "fiscal duties" should or should not appear in this calculation of an index, and he presented most cogent reasons why they should come in. But then, very inconsequentially as it seemed to Mr. Webb, he expressed the opinion that from his own personal point of view he would prefer to leave out these fiscal duties, for the curious reason that the countries which imposed these duties did so with the object of raising the maximum revenue, and therefore of disturbing trade to the least possible extent. As a matter of experience, Mr. Webb did not think that was the case. The maximum revenue was not coincident with the maximum trade. He thought that it could be demonstrated that with increasing fiscal duties one could go on getting increased revenue with diminishing trade. He saw little difference, from the point of view of the subject under discussion, between what were called "fiscal duties" and what Mr. Loveday called "protective duties." They were both obstructions to trade. There were innumerable cases where they shaded off into one another, and it was often difficult to see where a fiscal duty ceased and a protective duty began. Again, in comparing different countries, what was a fiscal duty in one might be a protective duty in another. If Mr. Loveday's principle were followed it would be necessary in some cases to ignore items of the tariff in certain countries because they were fiscal, but to bring them into the calculations for other countries because they were protective. Mr. Webb thought that, on principle, there was no case whatever for ignoring these fiscal duties in calculating tariff indices. Mr. Loveday had given cogent reasons why they should be included, and Mr. Webb failed to appreciate the reason that led him to an opposite conclusion.

A second point was in connection with the treatment of import prohibitions in relation to this problem. Mr. Loveday referred to prohibitions only once, towards the end of the paper, under his general conclusions, and in a rather scornful way, seeming to indicate that prohibitions might be perfectly relevant to the measurement of protective tariffs, but irrelevant otherwise. Mr. Webb said he failed to see in this connection the difference between a duty which in

effect was actually prohibitive, and out-and-out prohibition. In principle they were both the same, but of course in actual practice, when calculating an index-number based on duties, there was the difficulty that prohibitions would not be capable of arithmetical treatment. The only thing he could suggest, if prohibitions were numerous enough to matter, would be to convert them, for purposes of the index, into arbitrary but reasonable rates of duty. Fortunately, however, prohibitions were probably becoming scarce enough to ignore.

There was one other matter to which he would like to refer, which did not directly bear on the subject Mr. Loveday had been discussing, but it raised a small question of economic interest. On page 497 Mr. Loveday said, "When rates are specific, then the average (not the aggregate) value of the imported goods in any tariff group is likely to be higher than would have been the case had no duty existed or had the duty been *ad valorem*." Mr. Webb was not prepared to accept that statement; he thought it was a case where investigation and evidence were required. It could be argued, on purely economic grounds, that where a specific import duty was imposed there would be traders who sought to import goods at the lowest possible price in order that the effect of the specific duty should be minimized in relation to the demand of the consumer for the imported article. He thought it would be possible to illustrate that at least in the sphere of fiscal duties, and probably among protective duties also. For this reason Mr. Webb was not prepared to accept Mr. Loveday's proposition as an economic or fiscal axiom without some further demonstration of its truth.

In conclusion Mr. Webb said he would like to join heartily and sincerely in the thanks that had been accorded to Mr. Loveday for his paper. It dealt with one of those intriguing and annoying problems about which one felt sure that there ought to be some simple solution, and he believed it was not beyond the ability of Mr. Loveday and other statisticians to devise a method which might at any rate give an indication of the numerical values of those walls on Sir Clive Morrison-Bell's tariff map, to which he had referred in his opening remarks.

HERR SCHERPENBERG said he had followed Mr. Loveday's paper with an interest which was the greater as in the last few days he had had a personal experience which fully confirmed Mr. Loveday's view on the very great difficulties which stand in the way of this kind of comparison of tariffs of different countries. For practical purposes he had been preparing a list of the rates of duty on different goods in Germany and in England, and this list was framed from the official German trade returns. The difficulties which presented themselves to him on this occasion were of a very different kind, and some of them had not been mentioned by Mr. Loveday or by those taking part in the discussion, and for this reason he thought he might refer to them.

For one thing, if a specific duty had to be converted into an *ad*

valorem duty on the basis of the average price of imports of a certain commodity, it was necessary, in order to get a good comparison of the rates to be paid, to deduct from the whole imports all re-exports, as otherwise a correct figure for the value of the retained goods, which only mattered, would not be obtained.

As to the protective effect of the duties, it might be well to add that there was one point which was of great importance, because there might be a very different protective effect according to the classes of goods and commodities which were subjected to a duty. For instance, as soon as a duty was levied on goods which entered into the cost of production of other goods, the protective effect would be taken away from any duty which might be put on those latter goods, whose cost of production had been augmented by duty on the other goods.

To return to the list which he had prepared, this gave rather interesting results; it was, of course, only the first step on the way to the general index mentioned by Mr. Loveday. In order to avoid unfair generalizations it was limited to a certain number of commodities used in Anglo-German trade, and especially to those commodities which were protected by duty in England, and the interesting result was given that in almost all cases the rate of duty in Germany was much lower than the rate of duty in England.

Herr Scherpenberg agreed that it was very difficult to see just the protective effect, and to come to a full appreciation of the importance of this comparison, owing to the great difficulties encountered in getting at a fair comparison of tariff burdens generally—as Mr. Loveday had shown so admirably. On the other hand, it was perhaps not unfair to say that even if one might be of opinion that certain of these comparisons seemed to be more favourable than they were in reality, in every comparison of this kind one must consider the fact that for the protective effect the main factor was whether the primary commodities, such as food-stuffs and raw materials, were subjected to duty or not, and as in England these goods were generally free from duty and in most continental countries they were subjected to duty, he thought the protective effect of duties in England was rather higher than it was in continental countries.

MR. C. O. GEORGE said he would like to commence with a brief reference to the remarks made by Dr. Snow—not to his valuable suggestions with regard to the making of separate indices, but to a casual suggestion thrown out by him that a time index might be obtained by dividing the total amount of customs duties by the total value of goods imported. This reminded him of the figures obtained at Geneva, which he would like to quote. In the case of Germany, the scientifically-prepared figures obtained by Mr. Loveday under method A showed that the tariff level increased between 1913 and 1925 from 12-16 to 15-16 while in method B₁ it remained at 12. Under the method suggested by Dr. Snow, Germany showed a decrease—from 8-20 per cent. in 1913 to 4-78 per cent. in 1925, which

indicated one of the many dangers of that method of measuring tariff changes.

Another point he would like to raise was the question as to what this tariff level index did actually measure. If such high duties as those on tobacco and spirits in this country were to be excluded, could the index be said to measure the tariff level?

If the index be based on obstruction rather than protection, it was clearly difficult, as had been pointed out, to tell where obstruction ceased and protection began. The problem of measuring the degree of protection presented many difficulties, but it was perhaps possible to over-emphasise the importance of certain theoretical objections. If they had attempted to be so precise, would there have been such a thing as a cost of living index, which, although far from critic-proof, had been of great utility? One was faced with some of the same difficulties in measuring the degree of protection, but would it not be possible to obtain such an index—of some degree of accuracy—which might be of great utility provided its limitations were realized?

As an illustration of another difficulty—that of obtaining a correct value of protected goods—Mr. George quoted the change in 1926 in the duty on arc lamp carbons, which was altered from 33½ per cent. ad valorem to a specific duty of 1s. a pound. A Committee which reported in that year pointed out the difficulty of ascertaining correct values owing to the fact that foreign exporters adopted the method of selling in this country through sole agents, hence the Government's decision to introduce an approximately equivalent specific duty in the place of the ad valorem duty. The change was followed by a considerable increase in the amount of duty obtained.

MR. C. W. PEARSALL said he had listened to Mr. Loveday's paper with very great interest, partly because he seldom had an opportunity of being present at one of the Society's discussions as he lived so far away, and although he had had much correspondence with Mr. Loveday, it was not often that he had an opportunity of meeting him.

The subject was of very considerable interest to him, and Mr. Loveday had collected an enormous amount of material showing the great difficulties in constructing any index, but it had just occurred to him that one could construct an index of a completely different weighting, and although it might not measure the protective level accurately, it would measure it in some degree more successfully. The point was, that if one tried to measure a degree of protection afforded by a duty, the more effective it was, the more likely that imports would decrease, and therefore something of an inverse nature must be looked for. As imports decreased owing to protection, production in the country theoretically ought to increase, and if one were to construct an index by applying the tariffs on the imports to the net production of the country of similar goods, it might be possible to build up some kind of index that would show, roughly speaking, the effect of the tariff. The more that internal industry expanded

under a protective tariff, the more would this index-number increase, being roughly an index of protection. Mr. Pearsall said he was not talking of the possibility of the thing—it might be exceedingly difficult—but he would like to know whether theoretically a thing built on those lines would not give a better figure for the effectiveness of protection.

In the other idea of measuring what the weight of the tariff was on the people, it might also be a considerable help, because people were often deceived as to the effect of tariffs. They found so much duty was collected on imports, but did not realize that the prices of the things produced at home were also increased, and therefore that the weight was much heavier than the Customs collection, whereas a good measure of this character might show the position to the people of the country more clearly.

Mr. Flux said he would like to say a few words before inviting Mr. Loveday to reply to the suggestions and criticisms made. In the first place he wished to express his own pleasure at having had the honour of presiding at a meeting where a paper of a novel character for the Society—such as that brought forward by Mr. Loveday—had been presented. In a year which had seen the foundation within the Society of the Study Group, there was a special appropriateness in reminding Fellows that it was not only in the new institution that the study of the statistical methods applicable to particular economic problems was taken up, but that the Society at large was also interested, as a large Study Group, in like questions. There was perhaps one qualification to apply there. Those who were in the habit of comparing different contributions to the debate would have noted that there had been some lack of unanimity as to what was the particular problem being studied. That was a striking feature both in the paper and in the discussion. Mr. Loveday had pointed out by what different avenues different students approached the problem, and he had pointed out his lack of sympathy with certain objects of some of these students.

It appeared to Mr. Flux that the problem Mr. Loveday had brought forward might perhaps be described as an attempt to measure the relative size of the contribution of different countries to the diversion of the flow of international trade from what it would have been in volume and in distribution, if there were no tariffs at all. It was not the burden on the citizens of the tariff-imposing nations; it was not the protective effect on special groups in those nations, but the distortion of the commercial structure of the world which appeared to be the prime object of the research which Mr. Loveday had in mind. If that were the case, one might be able to appreciate more clearly his mode of approach to a solution of the problem. One would imagine that if a statement could be provided of the trade of the world, as it would be if there were no tariffs at all, that would give the proportion in which the different duties, of which account had to be taken, should contribute to the structure of the index to be built up. Of course that could not be had, and one would have

to justify in one's own mind the sympathy one felt with Mr. Loveday in his theory that the order in magnitude of the figures—which were higher and which lower in the series—might not be much disturbed by basing the calculation, not on data relating to the trade of the world in an undisturbed condition, but after the disturbance had taken place, and therefore affected by distortion. The true magnitude of the index would not, perhaps, be satisfactorily determined, and those relating to the different countries would not follow in the same proportion as would have been the case had it been possible to use undisturbed quantities for weighting the index. Mr. Flux could sympathise with Mr. Loveday's suggestion that, though there was a distortion, the procedure he had proposed was likely to raise or depress the figures which represented the different nations in roughly similar proportion, so that those which were highest in one calculation would be highest in another, and there was not much chance that one would disturb the order of the figures.

There was one other point to which he would venture to refer—the question of fiscal duties. He thought his own preference would be for an index omitting goods that were the subjects of fiscal duties; but, in addition, it was desirable that a series of indices including those goods should also be recorded. The reason was that they were trying to measure the barriers to international trade, whereas the fiscal duties that were offset or balanced by internal excise duties were not only obstacles to international trade, but also to all kinds of exchange everywhere. We were primarily concerned with disturbances of the international movements of goods, and not directly with those which applied to national as well as to international exchange of goods. That was why a separate consideration of these two groups of subjects was wanted. If both sets of figures were calculated, the views of those who were prepared to disregard the peculiar character of those disturbances to exchange might be met.

Mr. Pearsall had suggested that they should take as a basis something that was mentioned in Mr. Loveday's paper, though not in his summary—the production of goods by the different nations. Mr. Flux did not think the production basis would be directly applicable to the problem he had enunciated, and it was, perhaps, for that reason that Mr. Loveday turned aside from it in his paper, and why he would not be disposed to think it the most admirable method by which one should proceed.

Indices having an entirely different object might be constructed wherein that basis might properly be adopted, but he did not think it well suited to measuring the obstacles to international trade, which was the first purpose Mr. Loveday was designing for the index.

The Vote of Thanks was carried unanimously.

MR. FLUX called upon Mr. Loveday to reply.

MR. A. LOVEDAY said: I am extremely obliged to the Society for the kind way in which my paper has been received. It is a

great satisfaction to me to feel that the general line of argument contained in the paper has, on the whole, been accepted; I say has on the whole been accepted, because, although certain criticisms have been raised, I find myself in agreement with nearly all of them and do not think that they affect my general thesis.

I propose now to take up a few points that have been raised and omit those to which replies have already been given in the course of discussion.

Sir Hubert Llewellyn Smith suggested that it might be useful and helpful if the general international index were composed of a number of national indices. No doubt that proposal has the advantage that you would thus get not only the international index but at the same time national indices. But it has the disadvantage that in practice it would prove an expensive undertaking, because it would involve the compilation of a sample list of commodities for each country adequate for the compilation of the separate national indices. In my system the total list has to be made as representative as possible of the trade of the world. That might be done by means of a series of national lists less comprehensive than the lists required for making national indices.

Were the time and means available, however, it would no doubt be interesting to compile national indices at the same time as the international.

I completely agree with Dr. Snow that one does not get for all countries a genuinely random sample. However, I do not believe a tariff index can be devised by means of which the tariffs of all countries can really be measured irrespective of how they are composed. I do not believe a space index can be made applicable to both Czechoslovakia and the United Kingdom. I do not believe, in fact, that a statistical measurement can be found for comparing the tariff of a country which imposes a few very high duties with that of another which imposes a large number of duties, high or low.

I think that the question put by Sir Basil Blackett has been answered in the course of the discussion. I would only add that, in my opinion, the value of a tariff index lies in the fact that it advances you one stage in knowledge. It is, I believe, true, as I have argued, that you cannot measure the degree of protection of any two countries by means of such indices because of the differences which exist in economic structure. But if you have general knowledge of those differences in the economic structure the tariff index may prove of value and, indeed, may prove indispensable in any attempt to frame a judgment as to the probable effects of the tariffs imposed by any two or more countries. Further, as I have pointed out, the time indices are not subject to the same limitations as are space indices.

I completely agree with Mr. Webb when he says that my statement on page 302 about fiscal duty is ostensibly illogical; indeed, I said so in my opening remarks, and if I felt that the whole world would realize the argument in favour of including fiscal duties I would include them. I am of the opinion, however, that the force of this argument is not likely to be generally realized, and that the inclusion

of fiscal duties would, in consequence, lead to a confusion of thought on the subject and a general mistrust of the indices which would greatly limit their value.

With reference to the effect of specific duties on the value of goods imported, I quite agree that cases may arise in which exactly the opposite effect to that which I indicated is produced. I said, "When rates are specific, then the average (not the aggregate) value of the imported goods in any tariff group is likely to be higher than would have been the case had no duty existed or had the duty been *ad valorem*." I quite realize that in point of fact the effect of the specific duty may depend *inter alia* upon how high the duty is and, in addition, on the width of the group of commodities covered by the duty. I should perhaps have introduced some further words of qualification, but even qualifications can be exaggerated, and I doubt whether my statement is, in fact, too strong. I believe that in the majority of cases the tendency which I have indicated exists.

The other points raised were really all directly or indirectly connected with the question as to the exact object of the index—a question to which I have already attempted to reply. I would repeat in this connection that the main difficulties occur only in the case of a space index—time indices are not subject to the same limitations. But owing to the necessarily rough character of the calculation, time indices should, in my opinion, not be made too frequently, and I note with satisfaction the opinion expressed by Sir Hubert Llewellyn Smith that once in five years is probably the minimum period for their calculation.

As a result of the ballot taken during the meeting, the candidates named below were unanimously elected Fellows of the Society:—

Hugh Haslund Bailes, A.C.A.
Paul Bertram Burbidge.
William Harold Clough.
Hubert Peter Morrison, M.C.
Nelson Hindley Prouty.

Frank Alexander Ruler.
Leslie Storey, A.I.S.A.
W. B. Sutch.
Edgar Sydenstricker.

The following were elected to Honorary Fellowship :

Clément Léon Colson.

Ernst Friedrich Wagemann.

THE NEW SURVEY OF LONDON LIFE AND LABOUR.

By SIR H. LLEWELLYN-SMITH, G.C.B., M.A., B.Sc.

[Read before the Royal Statistical Society, June 18, 1929,
the President, Mr. A. W. FLUX, C.B., in the Chair.]

Introductory.

IN May, 1887, just forty-two years ago, Charles Booth read a paper before the Royal Statistical Society giving the first public account of the progress of the great survey of social and economic conditions in East London which he had initiated in the previous year. I say East London advisedly, because in its inception the enquiry was confined to that quarter of London, chosen because, as was stated in the above paper, "it is supposed to contain the most destitute population in England and to be as it were the focus of the problem of poverty in the midst of wealth which is troubling the hearts and minds of so many people." * The paper gave an outline of the method of the investigation, and also preliminary results for the Tower Hamlets. Eventually the scope of the Survey was enlarged to cover the whole of London, and the results of this colossal undertaking, conceived by Charles Booth's genius, financed out of his private means, and personally directed by him throughout no less than seventeen years, were embodied in a series of seventeen volumes, issued at intervals from 1889 to 1903.

For the purpose of the present paper I am going to assume that the character and results of Charles Booth's Survey are known at least in a general way to my audience. Otherwise I should be bound to occupy at least the whole of my allotted time in describing them even in the barest outline.

"My object," wrote Booth, "has been to attempt to show the numerical relation which poverty, misery and depravity bear to regular earnings and comparative comfort, and to describe the general conditions under which each class lives." And, as everyone knows, the results were given both statistically and graphically by means of a graduated classification of the population, and a coloured Poverty Map. The main Poverty survey was supplemented

* p. 4.

by a series of detailed studies of the conditions of different London industries, and of special subjects and problems affecting London life and labour, such, for example, as "sweating," influx of population, and the like, concluding with a remarkable series of volumes whose title, *Religious Influences*, scarcely gives an idea of the breadth and variety of the influences and agencies brought under review, which included all forms of social organization as well as the institutions of organized religious life.

The enquiry throughout was avowedly "static" in character: it aimed at presenting an instantaneous picture of conditions as they existed at a given time, but generally speaking the methods used did not enable tendencies to be measured or causes to be discovered. Charles Booth was perfectly aware of the necessary limitations of the scope of his work. "My principal aim," he writes in one of his latest volumes, "is still confined to the description of things as they are. I have not undertaken to investigate how they came to be so, nor, except incidentally, to indicate whither they are tending; and only to a very limited extent, or very occasionally, has any comparison been made with the past. These points of view are deeply interesting and not to be ignored, but are beyond the scope of my own work." *

The Survey threw a flood of light on the numerical relation of poverty to well-being, but it could not, of itself, furnish an answer to the insistent questions, "Is poverty growing or diminishing? Are conditions becoming better or worse?"

To answer these questions a necessary preliminary step was to re-survey the ground on the same general principles and maintaining so far as possible the same standards, after a sufficient interval of time had elapsed to make comparisons fruitful. I believe that Charles Booth always hoped that some day such an effort would be made, but for a good many years the means of organizing and financing a fresh survey were not forthcoming.

Now at last the initiative of Sir William Beveridge and the Governors of the London School of Economics and Political Science, and the generous research grants received from such sources as the Laura Spelman Rockefeller Memorial, the London Parochial Charities Trustees, and some of the great City companies and other public-spirited bodies, have made it possible to attempt a new Survey of London Life and Labour.

This work was started with some fear and trepidation a year ago, forty-two years after the beginning and twenty-five years after the conclusion of Charles Booth's epoch-making work.

In the interval new sources of information have become

* *Religious Influences*, i. p. 5.

available, boundaries have changed, centres of gravity of population have shifted, great organizations of a remedial character have come into existence. It is out of the question to repeat the Survey of forty years ago in exactly the same form, over precisely the same area, and by identical methods. Even if we could shut our eyes to all the fresh sources of information and means of research which have since become available, we should not, in view of the redistribution of population, be really comparing like with like, still less should we be laying any foundation for future comparisons—a matter not less important than establishing a comparison with the past.

I have said enough to suggest to you how immense, many-sided and complicated is the problem which we have had the temerity to attack. It is the object of the present paper not to present results; for this the time has not yet come; but to describe in brief outline some of the problems by which we are faced and the methods by which we are endeavouring to accomplish their solution.

The Methods of Charles Booth's Survey.

The method of Charles Booth's Poverty Survey differed from that adopted by later investigators in certain provincial towns in three important respects. (a) His classification was not determined by applying any single objective standard, but by judging the net result of a number of factors, of which family income, though the most important and the most readily measurable, was not the only one to which weight was attached. Later investigations were explicitly based on an objective standard, representing the estimated cost of satisfying the minimum requirements of an average family. (b) Booth's Survey was extensive; that of the later investigations intensive; that is to say, for Booth's purposes the social condition of every street was explored, so far as disclosed by the conditions prevailing in that large section of the population which is represented by families with children of school age. Whether this section (which included a good deal more than half the entire population) was fairly representative of the whole, in respect of economic conditions, is a question which Booth discussed at length, and to which on the whole he returned an affirmative answer, considering that the higher earning power of men in the prime of life was at least counterbalanced by the increased cost of maintaining a young family. Our own experience and the knowledge gained from other researches dispose us to think that the result of basing a classification of the whole population on the ascertained condition of families with school-children was probably to darken somewhat the shades of Booth's picture, and that this effect would be more

appreciable at the present day, when the aged and infirm have new sources of income secured to them. One of our problems is how to allow for this factor while maintaining continuity of comparison. This, however, is a digression. (c) Charles Booth's investigation of the condition of the families with school-children was not for the most part made by direct house-to-house enquiry, but indirectly, by tapping the knowledge of persons who in the ordinary course of their duties come into intimate contact with the population surveyed. As is well known, the backbone of the Poverty Survey was the analysis of information furnished by School Board Visitors, checked and supplemented by reference to other sources, including the police, clergy and others. The great possibilities of this method of indirect investigation constituted one of Booth's most fruitful discoveries in social enquiry. It will be evident that its success depends very largely on the precautions taken to secure uniformity of judgment in the final assessment of the results so obtained. This is one of the greatest practical difficulties in repeating the Survey at this distance of time on comparative lines.

Methods of Later Enquiries.

In contrast to the methods above described, the characteristic principle of the investigations conducted by Professor Bowley and his colleagues in 1914 and 1924 was that of "random sampling." It is fortunately not necessary in this Society to explain at length the principles of sampling. The methods employed by Professor Bowley are very clearly and explicitly set out in the two reports * recording these investigations, and particularly in the later volume entitled *Has Poverty Diminished?* In a word, the method depends on very careful preliminary arrangements to avoid the possibility of bias in the selection of the working-class families to be investigated. This being done, the families so selected (who may be one in twenty or one in fifty of all the families in the area, for the exact proportion is not very material provided that the number of cases included in the sample is sufficiently large) are investigated by direct house-to-house visits, and the conditions recorded on previously prepared cards.

Choice of Method for the New Survey.

At the outset of our enquiry we had to decide which of the above precedents should be followed. Each had its own special advantages and drawbacks. On the one hand, the sampling method, if carefully

* *Livelihood and Poverty* (1915), by Professor Bowley and Mr. Burnett Hurst, and *Has Poverty Diminished* (1925), by Professor Bowley and Miss Hogg.

and successfully carried out, is capable of yielding information much more detailed and precise, as to the composition of the working-class family, housing accommodation and rent, number and ages of the earners, total income, family income, and other matters than it would be practicable to obtain through the "extensive" and indirect methods of the Poverty Survey. On the other hand, the results of a sample enquiry could only be regarded as representative for large areas; no unit less than the borough area would furnish sufficient sample cards to yield a good average. Consequently this method by itself could not be used to determine the local distribution of poverty, street by street, and hence it would not enable the Poverty Map of London to be reconstructed. Nor would the sample cards, except rarely, give direct information as to poverty due to personal habits as distinct from that due to deficient income.

I need not trouble the Society with a detailed discussion of the considerations which we had to weigh in solving this problem, since the final outcome was to convince us of the necessity of combining the two methods, by instituting two concurrent surveys, the one extensive and indirect, the other intensive and direct, following respectively the general lines of the two types of investigation referred to above, and checking and supplementing the results of each by reference to the other.

In all that follows I use the term "Poverty Survey" when referring to the "extensive" indirect enquiry, and the term "sample enquiry" in reference to the "intensive" direct investigation by the method of "random sampling."

Though the adoption of this double method materially increases the labour and cost of the New Survey, I feel sure that this course will be fully justified by the greatly increased value of the results for the purpose of comparison with the past and future.

Relation of Poverty Standards in the two Enquiries.

The decision at which we arrived brought at once into prominence a fundamental preliminary question. How far is there concordance between the basic definitions and assumptions on which the two types of investigation were founded? In particular, did the "poverty line" as defined by Charles Booth differ substantially from that fixed by Mr. Seebohm Rowntree for his York enquiry of 1899, by Professor Bowley and his colleagues for the purpose of the provincial enquiries of 1914 and 1924, and by the New Survey for the present "sample" enquiry in London?

When Charles Booth started his Survey of poverty, and fixed the definition of "poor" and "very poor" for the purpose of his classification, the science of measuring nutriment by means of

calories and protein content was still in its infancy. A good deal of pioneer work had been done by Germans in the 'eighties, but Professor Attwater, whose researches in America formed the principal basis of Mr. Seeböhm Rowntree's poverty standards in his York enquiry of 1899, stated in 1895* that very little attention had so far been paid to the German results either in America or in England. Presumably none of the results of Attwater's experiments were known at all widely in England when Booth started his Survey, and certainly no use was made of them in that enquiry. Booth has, however, published data as to the quantities and prices of food consumed by a certain number of families in different social grades, which though too restricted and incomplete for the establishment of accurate statistical averages, afford a much-needed link with the later researches, in which the poverty line was explicitly fixed by reference to the estimated nutriment value of minimum dietaries.

Without going into minute detail I may say that an examination of these data suggests that the weekly food expenditure in 1890 of a family just below Charles Booth's "poverty line" was about 4s. per equivalent adult, and that the food thus purchased yielded roughly 3,000 calories. In Mr. Seeböhm Rowntree's study of poverty in York in 1899 a minimum of 3,500 calories was adopted. The minimum dietary adopted by Professor Bowley and his colleagues for the enquiries of 1914 and 1924 in certain provincial towns yielded about the same number of calories, and cost 4s. 6d. per adult in 1914 and 7s. 6d. in 1924. For the purpose of the new London sample enquiry a minimum dietary has been adopted after very careful consideration, the weekly cost of which per male adult in ordinary manual work is about 7s., and which yields about 3,300 calories, while supplying the necessary minimum of protein and vitamins.

It will be noted that there are slight differences in the calorie yield of the minimum standards used in the various enquiries, and that they have all been somewhat higher than the yield deduced from the actual budgets published by Booth. Too much significance, however, should not be attached to a difference which, even if it actually exists, only represents a few pence in actual cost. (For example, the cost in 1890 of raising the standard from 3,000 to 3,300 calories would have been only 2½d. per week—the price of a 2lb. loaf.) Moreover, it is to be remembered that the dietaries used in the later investigations were specially constructed to yield the maximum of calories. It is true that the dietaries used in Professor Bowley's enquiries were more consistent with actual habits of expenditure than that employed by Mr. Seeböhm Rowntree, and the

* *Methods and Results of Investigations on the Chemistry and Economy of Food*, by W. O. Attwater, p. 206 (U.S. Department of Agriculture).

minimum dietary constructed for the purpose of the new London Survey is closely akin to the budgets collected in Cost of Living enquiries. Nevertheless, all these dietaries postulate more careful and scientific expenditure than can reasonably be assumed to be general. On the other hand, Booth's budgets represented actual consumption by families who had not the knowledge or opportunity to make the best use of their money. Probably the effect of this difference of basis would be slight in the case of families at or below the "poverty line," who have comparatively little free choice as to dietary, but it would tend so far as it went to diminish the difference between the standards.

On the whole, and having regard to the approximate nature of the data, it seems reasonable to regard the standard of 7s. or thereabouts adopted for the present enquiry as corresponding with sufficient closeness both to those of the previous provincial enquiries and to the Booth standard of 4s. in 1890. It follows that the "poverty line" fixed for our main Poverty Survey will not differ appreciably from that fixed for the new sample enquiry.

In confirmation of this conclusion it may be observed that (1) if, as is probable, about two-thirds of the total income of a family living in poverty in 1890 was habitually expended on food, the food expenditure of a "standard" family with 21s. income would be 14s., or just over 4s. for each "equivalent adult."* (2) The estimated rise in the retail price of food of workmen's consumption in London between 1890 and 1928 is 76 per cent., which would raise 4s. to almost exactly 7s.

It is evident from these calculations that though Charles Booth arrived at his standards without the aid of the modern scientific apparatus of calories and vitamins, he was guided by a sure instinct to conclusions not appreciably different from those which would have resulted from the use of the more objective methods of measurement now in use. I feel that this confirmation should strengthen our confidence in the soundness of his judgment in matters in which we have not always the same means of verification.

Maintenance of a Fixed Poverty Standard.

Having thus related the basis of the New Survey to those of the previous enquiries, we are faced with a new and serious difficulty of a practical order, which will appear most clearly if I describe in a very few words the procedure which we follow.

* The workmen's budgets published by the Board of Trade in 1904 showed that the average expenditure on food by 53 families in the London area with incomes less than 25s. a week was 14s. 1½d. out of an average income of 21s. 5d., or almost exactly two-thirds (see Cd. 2337, p. 14).

In the main Poverty Survey we are pursuing substantially the methods of Charles Booth, supplemented by information from sources which were not open to him. Thus we begin, as he did, with exhausting the information obtainable from the school Attendance Officers, the successors of the former School Board Visitors, whose services have been generously placed at our disposal by the London County Council.* Then we add to the information on each street card supplementary data obtained through the Employment Exchanges, Relieving Officers, Police, Probation Officers and others. Finally, the general effect of all the information with regard to each street unit is assessed for two purposes—(a) the classification of population and (b) the street map of Poverty. I shall have something to say both about the classification and the Map directly. For the moment I only want to bring out the fact that, as in Booth's Survey, so also in the New Survey, the ultimate assessment depends on the exercise of a reasonable and uniform judgment as to the net effect of a number of factors, some of which cannot be statistically measured.

In endeavouring to "standardize" these judgments and to maintain their general level, so as to obtain results comparable with those of the Booth Survey, we find ourselves engaged in an uphill fight against a strong natural tendency, on the part of the persons interviewed, to replace Booth's poverty standards by those which accord more closely with the changed ideas of the present day, as to the necessary minimum requirements of a civilized existence. There is abundance of indication that current ideas as to the meaning of "poverty" and the position of the "poverty line" have been considerably modified during the past forty years. Probably it would be not far from the truth to say that, at any given time, most people visualize "poverty" as arising when family purchasing power falls materially below that resulting from the current income habitually obtained by unskilled labour. Now the average wage of unskilled labour in London has risen since 1890 by a good deal more than the cost of living, the percentage increase being probably as much as 120 per cent., while the cost of living of the wage-earning classes has only risen by between 80 to 90 per cent. If, therefore, we followed the current trend of opinion, we should raise the upper income limit of the "poverty" class not by 80 to 90 per cent., but by a materially higher percentage. A little thought, however, will show that the result of fixing our poverty line, by reference, not to a fixed minimum standard of consumption, but to a changing standard of average remuneration would be to vitiate all our comparisons. In

* In this Survey we take the street or section of a street as the unit as was done by Charles Booth for the whole of London other than the Eastern Sector.

fact we should be reasoning in a circle, and we should be unable at the end of all our labours to answer the question, "Has poverty in London diminished?" The result would probably be to show about the same percentage of poverty as in 1890, not because conditions had remained unchanged, but because we should have shifted our standard in proportion to the change of conditions.

It is therefore to be understood that wherever the term "poverty" is used in connection with the present Survey, it means the *conditions of life recognized as poverty according to Booth's criteria*.

I need hardly say that this use of the term in no way implies acceptance of the Booth standard as adequate to a satisfactory existence according to our present ideas, but is solely adopted in order to enable us to make intelligible comparisons on a scientific basis with the level of poverty forty years ago.

The Income Basis of Classification.

The income limits which Booth took as corresponding to the class of "poor" were 18s. to 21s. per week, and accordingly, after making the rather liberal allowance of 90 per cent. for the rise in the cost of living since that date, we have fixed the limits of 34s. and under 40s. for the corresponding class at the present time. Thus our "poverty line," so far as it is dependent on income, is fixed at 40s. a week for a family of normal size and composition.

I should like, however, to make it clear at this stage that all the standards and grades of classification established by Charles Booth, and adopted with minor modification by the New Survey, are intended to be based, not on income alone, but on the actually observed social and economic conditions of the family, *however caused*. Hence while "real" income is undoubtedly the most important factor in determining these conditions, and therefore rightly takes a leading place in fixing the standards and in assessing the grades of families and streets, any classification based on earnings is liable to be varied downwards or upwards in the light of information as to social habits (*e.g.* drink or gambling) or of evidence that the means of the family are seriously diminished by unemployment or ill-health or increased from extraneous sources (*e.g.* pensions).

With this important qualification the income limits of our classification may be stated as follows (the lettering applies throughout to Booth's social classes):

A and B ("semi-criminal" and "very poor"), below 34s. (As between A and B the subdivision is not by income but by character, and as in Booth's time is statistically very doubtful.)

C and D ("the poor"), 34s. to 40s. (corresponding roughly to

Booth's 18s. to 21s. after making allowance for change in the purchasing power of wages). Though Booth set out to divide C from D, he eventually found himself obliged to amalgamate them in a single class, CD. We have followed his example for the same reasons.

E and F ("standard wages"). Here we diverge from Booth, who amalgamated these letters in a single class containing all grades of wage-earners above the "poverty line." Even in Booth's time this amalgamated class included more than half the population, and our Survey shows that at the present time, with the rise of wages and well-being, this proportion would be so greatly increased as to make it imperative to subdivide the class into at least two categories if the classification is not to be deprived of much of its significance. We have therefore reconstituted the two separate classes E and F, class E corresponding roughly to weekly income limits between 40s. and 60s., and F to income limits between 60s. and 100s.

This line of division is approximately that between unskilled and skilled labour.

Classes G and H (middle class and wealthy) were determined by Booth chiefly on the basis of servants kept, a test which with changed social habits has broken down. Our minimum income limit is naturally the upper limit of class F, or say £250 a year for G. As between G and H the line of division has not yet been definitely fixed, but it will probably be based in the main on the rateable value of the house occupied. As regards streets in which these classes predominate, very little information is forthcoming from the sources on which we mainly rely, but we are obtaining valuable data through the co-operation of house agents, while the results of the recent census for the purpose of the parliamentary register facilitate the task of estimating the population of these streets.

The Poverty Map.

From the determination of the social classification of the population we turn to the local or geographical classification of poverty and well-being, street by street. It will be remembered that an outstanding feature of Booth's work was the "Poverty Map," which showed at a glance the predominant economic and social condition of the inhabitants of each street by means of a series of colours, corresponding broadly to the "letter" classification of the population. Thus black corresponded generally to A, dark blue to B, light blue to C and D, and so on up to orange for H. In attempting, however, to follow this scheme and to repeat the Poverty Map a number of difficulties have arisen. A large number of streets are not homogeneous in the character of their population, but include members of two or more of the classes (AB, CD, E, F, etc.). It is therefore a

matter of judgment to assess the colour of a street from the available data as to the composition of its population, and it is highly desirable that this judgment should be exercised on principles which are not only uniform throughout the area, but are fairly comparable with the principles which Charles Booth applied to the same problem.

For our knowledge of the method of determining the colours of "composite" streets in the Booth map we have to rely on an analysis of a number of streets for which he has published full particulars, together with the valuable experience of Sir George Duckworth, who was concerned with the last two revisions of the Poverty Map, and whose advice and aid we have been fortunate enough to secure for our New Survey.

As the result we have been able to frame certain tentative empirical rules which conform so far as practicable to Booth's standards of colouration as ascertained by the above methods. At the same time we have been able very greatly to reduce the difficulties of the problem, by breaking up the streets wherever practicable into more or less homogeneous sections, to each of which its appropriate colour can be more readily assigned. We have carried this process so far that the residual "mixed street" with its heterogeneous inhabitants, that defied further analysis, has declined in importance from one-quarter to a very small fraction of the whole population. This we count as a great gain, for the predominance of the purple or "mixed" street was certainly the weakest spot in Booth's Poverty Map. We are proposing to indicate the comparatively few street sections which still remain obstinately "mixed" by some system of colour hatching, and to appropriate "purple" to the much more important class of streets corresponding to the letter E, which, as already stated, we have separated from F.

Area of the New Survey.

Having explained very briefly our system of classification, I must say a word about the area covered by the New Survey. Charles Booth's enquiry was strictly confined to the County of London, and at first sight it may seem that the best way of ensuring comparability would be to limit the New Survey to the same area. This course would have greatly facilitated our task and reduced the expense of the Survey, not only because the area would be smaller, but because it would be coterminous with the administrative area of the London County Council, instead of involving negotiations with a number of other Local Authorities, and also because some of the outside areas which are now practically part of London have only been "urbanized" for a comparatively few years,

and in some districts continuous statistics of economic conditions for any long period are lacking. Finally, in some of the more rapidly growing outside areas the changes in roads and buildings since the date of the last Ordnance Map are so great as to make the construction of a Poverty Map difficult without incurring the great expense of re-drawing the map.

On the other hand, a study of the Census results and other data for a series of years convinced us that in the eastern sector the centres of gravity of population and of poverty have shifted so much further east that a Survey of East London excluding West and East Ham, Leyton and Walthamstow would be very misleading, and that we were bound to face the difficulties of including within our Survey the immediately adjacent ring of wholly urbanized areas by which London north of the Thames is practically surrounded. South of the Thames where the county limits are already pushed far out into the semi-rural suburbs, the same reason for extending our limits does not arise. The Survey area finally chosen does not correspond accurately with any existing administrative area, and is, of course, much narrower than the Metropolitan Police district, which is usually termed "Greater London." The population in 1921 of the area which we propose to cover was about $5\frac{1}{2}$ millions, of whom $4\frac{1}{2}$ millions then lived within the County of London and $1\frac{1}{2}$ millions in the outside areas. Since then the proportions have certainly undergone considerable change, and probably at the present time the population of the outside districts is not less than a quarter of that of the entire area of the Survey.

I do not want to worry you with our innumerable minor troubles, e.g. those arising from changes of administrative areas since 1890, or from the fact that outside London the Poor Law Unions often embrace wider areas than those which we include, or that the areas served by Employment Exchanges (which did not, of course, exist in Booth's time) bear no relation to municipal boundaries. All these and other difficulties give rise to a great deal of labour, and we have continually to devise expedients for harmonizing the discordant data within reasonable limits of error. The nature of the empirical rules, however, adopted for such purposes would be of little interest to the Society, and their discussion would involve a large amount of technical detail. I only mention such matters that you may not be under the impression that all is easy going in practice even when the basic principles of the Survey have been fixed.

Progress already made.

Following the example of Charles Booth, whose first volume was entirely devoted to East London, we have begun both the Poverty

Survey and the sample enquiry in the eastern section of our area. Up to the present the Poverty Survey has been extended to a population of about 1,800,000, or about one-third of the entire population of the survey area, mostly in East and North-East London and its eastern fringe. Over this huge district the primary survey is now complete, and in most districts the supplementary data obtained from the Exchanges, Relieving Officers, and Police have also been tabulated. Progress is now being made with the work of revision, and with the definite grading of the population and streets, with a view to the provisional colouring of a section of the Poverty Map.

Concurrently with the Poverty Survey the sample enquiry has been making steady and satisfactory progress. Of this important branch of the work I do not propose to speak in any detail. I do not think we should have ventured to undertake this difficult and laborious task of direct investigation if we had not the great advantage of the co-operation of Professor Bowley, who was mainly responsible for the provincial enquiries of 1914 and 1924, and of whose pre-eminence both as a scientific and as a practical statistician this Society does not need to be reminded. The supervision of this section of the New Survey is, I am glad to say, in Professor Bowley's hands, and the knowledge of this fact, and of the basis on which the sampling method is founded, will be a sufficient guarantee to Fellows of this Society that the work is being carried out on sound and scientific lines.

All I need, therefore, say is that we are aiming at a sample of about 30,000 working-class households, selected automatically so as to exclude bias. The principal basis of the selection is the record of houses in the note-books of the School Attendance Officers.

Of the 30,000 cards, between 7000 and 8000 are allotted to the eastern area, which alone has been dealt with up to the present by the sample method. It is satisfactory that within this area over three-quarters of the sample cards have already been completed, and the remainder are steadily coming in. On the basis of this experience we have ground for hope that the difficulties anticipated in applying the sample method for the first time to London can be successfully surmounted.

Linking the Present and Past Surveys.

I have given so much space to the basic Poverty Surveys that I have left but little for the important subsidiary enquiries which are concurrently being made.

In the first place it has seemed to us that the gap of years since the original Survey is too great to be bridged merely by a single

repetition, *i.e.* by taking a second instantaneous photograph of social conditions forty years after.

The two Surveys need to be linked together by a continuous chain of data as to the movements which have taken place and the progress which has been made in the social and economic welfare of the London population during the intermediate period. Of course it is not possible, except to a very limited extent, to make original first-hand investigations retrospectively. All we can do is to marshal such figures and facts as exist, and to endeavour to present and interpret them in such a way as to throw light on the general changes of social and economic conditions during the past thirty or forty years.

This we are accordingly endeavouring to do, and the results will be embodied in a preliminary volume which will be introductory to the New Survey proper. This preliminary volume will deal with such matters as changes in population and its distribution by ages and by occupations, in the condition of the people as measured by such indices as wages, cost of living, employment, health, housing, pauperism, and crime, the means of transport, and the growth of public amenities.

The only statistics that can be used for this purpose are long-period data, and this limitation will restrict somewhat narrowly the scope of the volume, which will make no attempt to present a full and balanced history of economic conditions, but will be confined for the most part to the movement of measurable indices. I need hardly say, however, that long-period statistical comparisons present innumerable difficulties of detail, and are full of pitfalls for the unwary, especially when the basis of the only available statistics has been modified from time to time during the period under review, or when changes of circumstances and social habits during that period have altered the relative weight to be attached to particular items in the general index.

The only path of safety in these matters is to enlist the co-operation of experts whose intimate acquaintance with each branch of the subject-matter puts them on their guard against the manifold dangers arising from these causes. For example, the immense expansion of motor traffic has introduced a new kind of criminal offence, which may throw out any "over-all" comparisons of the growth of crime; changes in practice with regard to the notification, certification and classification of certain diseases may seriously impair comparative statistics of health and mortality; continual changes in the classification of occupations in successive Census enquiries makes the tracing of changes in the occupational or industrial distribution of the population a matter of very great difficulty. The fact that the

chapter on crime has been undertaken by Sir Edward Troup, that on health by Sir William Hamer, and that on occupations by Professor Bowley will, I hope, give confidence that the interpretation of these difficult comparisons will be in competent hands.

The Industrial Survey.

Concurrently with or shortly after the issue of this preliminary volume will, I hope, appear the first instalment of the results of the new Poverty Survey, including the sample enquiry and Poverty Map.

After this the sequence of volumes cannot at present be exactly predicted, but it is contemplated that besides the volumes which complete the Poverty Survey there will be one or two dealing specially with the industries of London, bringing up to date the contents of Booth's industrial volumes so far at least as concerns the principal groups of industries. It is felt, however, that a good deal of the work that was done for the purpose of Booth's original "industrial series" will probably not need to be repeated in quite the same detail. At present progress is being made with certain important industrial groups, including, *inter alia*, the clothing, boot and shoe and furniture trades, which, it will be remembered, were singled out in Booth's Survey as the special seat of the so-called "sweating system"—a form of economic disease which at that time was attracting special attention and giving rise to serious social anxiety, especially in connection with the influx of alien Jews into East London from Eastern Europe. It will be a matter of great interest to ascertain what progress has since been made in the elimination of "sweating," whether by the operation of the Trade Boards Acts or by the operation of other causes.

Special Subjects: The Use of Leisure.

Lastly come the sections of the Survey which will deal with special subjects. Some of those included in Booth's volumes have since diminished in relative importance, while others have assumed more prominence, and new ones have arisen. I do not at the present stage think it wise to forecast what special subjects we shall find it possible and desirable to include. Of that we must judge as we proceed. I may however mention one great group of subjects to which we are already beginning to turn our attention, and which in my view deserves more systematic exploration than it has hitherto received. I allude to the "use of leisure," employing that term in its very widest sense to include the whole of life except that part of it which is directly concerned with the earning of a livelihood, viz., the hours of work and of movement to and from the place of work. That

the real social value of higher earnings and shorter hours depends vitally on the use made of "leisure" in the wide sense indicated above is almost a commonplace. Yet the amount of scientific and intensive study that has been given to modes of expenditure and use of leisure, and particularly to the changes which have taken place in these respects in recent years, has been very much less than that which has been devoted to tracing changes in actual earnings, hours and the conditions of employment.

The subject, or rather the complex of subjects, embraced under this comprehensive heading is so vast and the ramifications are so far-reaching that I foresee that we shall have to restrict any attempted survey within severely narrow limits, if our task is not to become unmanageable. Such diverse subjects as meals, and family life, hobbies, games and amusements, reading, classes and lectures, social, religious and political activities, holidays and excursions, clubs and social intercourse, drinking, gambling and crime, come or might be brought within the wide ambit of such a Survey. So far our progress in this matter has been only tentative and experimental. There is, however, no branch of the whole Survey on which we should be more grateful for constructive suggestions of a practical character. There is time for this, for we shall probably not attempt to publish anything on the subject until the main Surveys have been completed.

Acknowledgments and Conclusion.

One of the most satisfactory features of the present enquiry, to which it gives me special pleasure to refer in public, is the unstinted help and encouragement which we are receiving from the various Departments of Government and from a large number of important public authorities. With very few exceptions these authorities have readily given us access to their stores of information bearing on the subject of our investigation together with the expert knowledge and experience accumulated by their officers in the course of their duties.

A foremost place must be given to the London County Council, which has given us generous and invaluable aid in freely putting at our disposal the School Attendance Officers, and in giving us the great advantage of the co-operation of their able Statistical Officer, and of reference to their statistical records.

So far as the Survey has already been extended to areas outside the County boundary we have found similar readiness to co-operate on the part of Local Authorities, among whom I would specially mention the Council of West Ham and its Officers. We have also

received valuable help from many Boards of Guardians and their officers.

Among Government Departments I would specially thank the Ministry of Labour, which has been most helpful in giving us access to its great stores of information as to employment, wages, cost of living and similar matters, as well as the advice and guidance of its expert officers. This, I need hardly say, is an advantage which Charles Booth did not possess, since he initiated his Survey before the establishment of any organised Department for the collection and publication of Labour Statistics. To be exact, the year 1886, which saw the beginning of his Survey, saw also the appointment of Mr. John Burnett as first labour correspondent of the Board of Trade and the carrying out of the first wages enquiry by the Board. This was the germ from which subsequently grew the Labour Department of the Board of Trade, the predecessor of the present Ministry of Labour. We have also to acknowledge with gratitude much valuable help from the Home Office, Commissioner of Police and Registrar-General, and other Departments.

Of my own obligations to our exceptionally competent secretary, Mr. Markham, and the small but excellent staff who are at work on the Survey, this is not the time and place to speak, beyond saying that to them is due any credit for the smooth and rapid progress of the work up to the present. However, it will be a long time before we take off our armour, and there will be other opportunities to express my appreciation to my colleagues. I ought, however, to mention that we enjoy the great advantage of a very able and helpful Consultative Committee, meeting at regular intervals at the London School of Economics, to which the Survey is indebted for its headquarters accommodation. The members of this Committee are drawn partly from the higher authorities and staff of the London School of Economics, partly from other sources, and each of them brings to our assistance some special and valuable type of expert knowledge and experience.

Lastly, I should like to say how much the New Survey is indebted to Mrs. Booth and Col. T. M. Booth for giving us access to the great mass of original note books and other records of the former Survey, which have been carefully preserved, arranged, and catalogued, and which are a rich mine of varied information with regard to local conditions and the methods of investigation employed. The world only knows the published volumes, but the wealth of unpublished material is also of extraordinary interest and value, especially to those engaged in the New Survey. I never look at these documents without feeling increased admiration for the magnificent work accomplished by Charles Booth and his colleagues during those

seventeen years. I can speak of this with complete detachment, since the small part which I personally took in the original enquiry was confined to the treatment of certain special subjects, and did not touch the main Survey of Poverty.

It is indeed no light task to follow the great pioneer, and if in certain matters we can now see further or more clearly than he did, this is chiefly because we are standing on the shoulders of the giant. For it was from Charles Booth perhaps more than from any other individual that came the impulse to extend and improve the collection of official statistics which has made possible the great modern developments in the apparatus of social inquiry. And I am convinced that the possession of far richer and more varied sources of information than those to which he had access will avail us but little unless we can also catch something of the faith and enthusiasm, the indomitable courage and patience, the sure and serene judgment, the humble and single-minded seeking after truth, which made Charles Booth one of the greatest and most inspiring of social investigators.

DISCUSSION ON SIR H. LLEWELLYN-SMITH'S PAPER.

MR. A. W. FLUX: It is my privilege to-night to move that our best thanks be given to Sir Hubert Llewellyn-Smith for his remarkably interesting paper regarding the new Survey of London Life and Labour. He has referred to the earlier enquiry of Charles Booth as one with which we are likely to be familiar. That is a view which, with the best disposition in the world to hold it, I cannot entirely share, as I have been forced to realize that the lapse of time has reduced the number of persons familiar with the methods and results of the earlier enquiry and, apart from those more or less associated with the new enquiry, I have found reason to fear that the methods of the earlier work may not be sufficiently familiar to present Fellows to put them in a position to take up the story where the paper started. I would, however, suggest that, in so far as that is the case, the situation is modified by one important fact, and has to be viewed in the light of another. The important fact is that we have the pleasure and privilege of having with us to-night a number of those—headed by members of Mr. Charles Booth's family, who are particularly welcome—very closely associated with the earlier work, and others with the later work. The other is that, if the later generation of Fellows of the Society are not familiar with what is recorded in the earlier volumes of the *Journal*, they will perhaps not be in a much worse position to appreciate the description of the methods applied to the enquiry than happens with some of us when we are privileged to listen to the description of some highly technical method of investigation in statistics, when the

methods that are being described may be even less familiar to some than the methods applicable to the problems of the New London Survey.

To those who, like myself, were just beginning to be interested in economic enquiry when Charles Booth was carrying out his epoch-making work, the problem has great fascination. Many others will be stimulated to ask the kind of question that was asked at the time when the earlier volumes of the Booth results were published, and the experience will be repeated that anyone who knew any corner of the territory covered was keen to show how his particular corner had been misunderstood, though, taking results as a whole, there was an inclination to accept the general reliability of the Survey. I am speaking here of ordinary people, interested in life in general, but having no serious training as economists and statisticians.

The utilization of the two series of results as means by which to measure change, will doubtless give rise to like critical comments as to their reliability. In this connection, I have myself been attracted by the indication in the paper regarding the definition of the poverty line, and the relation of the poverty line of the earlier to that of the later Survey. I recall some doubt regarding the selection of the level below which everyone was to be called more or less poor, and similarly in reference to the line chosen by Mr. Seebohm Rowntree. At that time what one may be allowed to refer to as the "fuel value" of food was a conception that was not very familiar to people in general, and we had no measure of the relation of the amounts which were stated by nutrition experts to be required, to the available supply of food. We do not know much even yet, and it might be useful if the enquiry made early in the War by a Committee of the Royal Society could be repeated. That Committee included some of the greatest experts, and one result of their work was that 4,000 calories was found to be available weekly per equivalent male adult, taking food as purchased.

It might not improbably be shown that during the time of the Booth enquiry, the food supply was lower in relation to the numbers to be fed than it was twenty years later. The figure I have cited represents the position in the five years immediately preceding the war. Even if the supply was less at the earlier date, it will be clear that the poverty line in Booth's time was below the average position of the population, and even much below, for the total supply is not likely to have been 25 per cent. less during his enquiry than it was immediately preceding the war. How much the poverty line fell below the average food ration available depends somewhat on the constitution of the population investigated, not merely on sex and age, but on the kind of work they were doing. London's share of the various kinds of work may vary from that of the country at large. It would not be safe to assume that the average ration was 4,000 calories per man to-day, and it might not be safe to measure the degree in which the poverty line fell below the average, by putting the figure of 3,000 for the poverty line against the 4,000

which was the average available twenty years later. Nevertheless, the present measure of what is taken as indicating poverty, however related to the average population of the time, would not appear to indicate as high a degree of privation as before.

While the question of 300 calories more or less in the average daily ration may be represented by a modest weekly outlay, the addition of a half-quartern loaf per week per man would mean adding over a third to the bread consumption, and the equivalent in meat would add over a half to the meat consumption. Even if the 1890 consumption of these articles had been as great as twenty years later, we might hesitate to accept a 10 per cent. difference in the fuel value of the food taken as something not of considerable importance, even though, in the case of bread, human fuel can be purchased cheaply.

These points provide some interesting commentary on the relative position of the poverty line in the earlier Survey and the poverty line being adopted at present. Perhaps we may learn that the poverty line of the earlier Survey is much further below the average of to-day than below the average of its own time; that is what we might expect to learn. We expect to be able to get some sort of measure of the relative position, but I am absolutely and entirely at one with Sir Hubert in the belief that the right procedure is to measure the relation of the population to an absolute standard of poverty and, as far as we can, to consider separately the question of changing conceptions of what constitutes poverty.

That the great task has again been taken in hand cannot but be of great interest to our Society. My earliest recollections of the Statistical Society and its home were bound up very closely with the name of Charles Booth; it was on a brass plate attached to the railings at the entrance, like that which bore the name of the Society itself, and I would like to stress the intimacy of his relation to our Society during much of the period when his great work was being carried out. It was at our meetings that the first results of the earlier Survey were presented and discussed. Referring to the volume which contains the report of that discussion, I found that the discussion was opened by no less an authority on economics than the late Professor Marshall, and among others who took part were Professor Leone Levi, Major Craigie, Mr. Stephen Bourne and Dr. Longstaff. I venture to hope that the Society will have opportunities of considering the results of the New Survey, not less definite and extensive than those that it had in relation to the Old Survey.

In thanking Sir Hubert Llewellyn-Smith for his paper this evening, we are in a certain sense engaged in the task of rendering homage to the man to whose inspiration the idea of this New Survey was due, and at the same time we may say that we are confident, considering the hands in which the work of the New Survey is placed, that the New Survey will be the best tribute we could have to the value of the Old Survey.

PROFESSOR J. H. JONES: As a provincial, I deem it a great honour to be permitted to second the motion proposed by the President. I have travelled two hundred miles to this meeting, and have done so with the express purpose of showing that those of us who work and live in the provinces are not indifferent to the good work that is being done in London at the present time. I venture first of all to express my personal gratitude to the London School of Economics for the courage that it has shown in undertaking once more the work that was first done by one whose greatness becomes even more evident as time goes on.

I venture, in the second place, to congratulate the London School of Economics, and those concerned with the work, upon the fact that it will be so largely under the guidance of Sir Hubert Llewellyn-Smith. It is, of course, well known that Sir Hubert Llewellyn-Smith is a man who possesses great courage. One who accepts the Chairmanship of a Government Committee appointed to investigate the wool textile industry cannot be lacking in courage! But we also know that he has other qualities which are not quite so frequently found in the country. It is said that when the Ministry of Munitions was first formed, in 1915, Mr. Lloyd George and Dr. Addison, when their staff consisted of themselves and themselves only, sent for our speaker of this evening. It is also said that Mr. Lloyd George placed the problem before Sir Hubert and left it to him to decide whether or not he had time to undertake the work of organizing a big Department. Sir Hubert is said to have replied that the Board of Trade was working so smoothly that he was left with nothing to do! He undertook the work—and those of you who know the history of Government Departments during the war will also know that the Ministry of Munitions was the only war-time creation that did not require to be thoroughly overhauled at an early stage of its career.

It would be presumption on my part to suggest that there is anything in the method of the enquiry that has been submitted to us this evening that calls for criticism, but I may perhaps venture, in no critical spirit, to draw attention to one or two points of difficulty. I observe with interest that there are to be two methods of enquiry into the subject of poverty, one being the method that was adopted by Mr. Charles Booth and his assistants, the other being what is known as the method of random sampling. The method of random sampling is one of very great value for certain types of investigation. For instance, the Ministry of Labour has quite recently conducted investigations into the character of the unemployed, and the results of the investigations have been presented to the Society by Mr. John Hilton in the form of papers. These results possess considerable statistical and economic value. But at the present moment I happen to be connected with a small investigation now being conducted in Leeds. It is not of much consequence; we want to know a little more about the habits of people as consumers of butter, and we have investigators going from house to house trying to find out certain things about the consumption of butter. If an investigator

knocks at a door at eleven o'clock in the morning, she may not get an answer; that is the hour when the rent-collector or rate-collector is expected to call, and the lady of the house is "not at home." If the door is opened, the lady of the house, seeing another lady, may immediately close the door again, because she assumes that the visitor has something to sell. Even when they get into conversation, and begin to converse about butter, it is extremely difficult for the investigator to convince the lady of the house that she is not going to wind up the interview by producing a sample pound of butter! Apart from that, in the majority of cases in certain types of streets, the answer supplied is that they "always buy the best butter," and when asked what is the best butter, they admit that they do not know. They always ask for the "best butter," and have not the slightest idea whether it comes from Yorkshire, New Zealand, Denmark or any other place. Very few confess to using margarine! The lady of the house is then asked the effect upon her of a rise or fall in the price of butter, and in many cases she replies, "It has no effect at all, because we know that if butter comes down, bacon goes up."

It seems to me that the method of sampling which is to be employed in the new London enquiry falls between the two illustrations I have given. It is extremely difficult for an investigator to go into a house and secure the sort of information required for any social purpose. It is human nature for a family to resent investigations. It is human nature for people to close their hearts and mouths, and to object to anything in the nature of an inquisition, and I believe that the sample investigation will prove very difficult for the investigators.

For that reason, I feel that the reader of the paper, if I may say so, rather under-estimates the value of the method that was employed by Mr. Charles Booth, and over-estimates the value of the method that has been suggested as a supplement to the first. As far as the quality and life of the people in any neighbourhood are concerned, I would, personally, prefer to accept the judgment of the officials who have got to know the families incidentally, in connection with other investigations, to accepting the judgment of people—possibly young investigators—who have gone to the houses seeking the information directly from people who resent that sort of thing.

I had intended to refer to the definition of poverty, but the President has already referred to it, and therefore I need only add one comment. Probably the Committee were right in adopting what may be called an absolute measure of poverty based upon physiological needs. But I would like to suggest that there will be a serious danger, later, that the result will be misunderstood. If the investigation shows that there is an amount of poverty which we may represent by 10 per cent., and that there was 10 per cent. of poverty when Mr. Charles Booth conducted his investigation, then it seems to me that 10 per cent. in 1929 is a much more serious thing than 10 per cent. forty years ago. For, in the meantime, we have made some progress, and we would naturally expect that the progress would be revealed to some extent in the reduction of the absolute and relative amounts

of poverty in the country as a whole, whether that poverty be judged in terms of relationship or in absolute terms, as in this enquiry.

My only other point is this, that I sincerely hope that the Committee of Enquiry will pay a great deal of attention to the by-products of Mr. Booth's work. I refer in particular to the section on industries. I am old enough to have witnessed the development of social legislation since the passing of the Trade Boards Act of 1909, and to know how much of the legislative progress of the last ten years may be traced to the investigations of Mr. Charles Booth and of those by whom he was followed. Those of us who are specially interested in the problems of economic organization, are very deeply indebted to the volumes on industry on account of the admirable surveys they provide of such industries as boot and shoe manufacture in London. It only became clear during the War, when the Government was compelled to control industries, that London was not only the administrative centre, not only the place where people spent their money, but also the largest manufacturing area in the whole country, and I believe that Mr. Charles Booth was the first man to draw attention to the size and importance of the manufacturing industries of this area. I sincerely hope that the Committee which is now undertaking the work afresh will bear in mind that that section of Mr. Charles Booth's work was of great value, and that those of us who live outside London, as well as those who live inside, are extremely anxious to know as much as they can, not only about poverty and the circumstances surrounding it, but also about the organisation of industry in this great centre.

It is with great pleasure that I second the vote of thanks.

SIR GEORGE H. DUCKWORTH hoped that everybody had listened to and appreciated the brilliant paper from Sir Hubert Llewellyn-Smith. To him, who had had an opportunity of reading it beforehand, it had been a revelation of the pains that were now being taken to bring up to date and to develop Mr. Charles Booth's great work.

He was no statistician, and therefore he could not speak on a quantitative basis such as he had no doubt all Fellows of the Society would prefer; the only reason why he had been asked by the President to address the meeting at all, was because he had been one of the original enquirers in the early Survey, after Sir Hubert Llewellyn-Smith had been called away to create the Labour Department of the Board of Trade. His remarks were in consequence to be taken rather on what might be called a qualitative basis. He had worked with Mr. Booth for over ten years, and one of the special things which fell to his lot was a qualitative survey of the streets of London, which led to the production of the Poverty Map, in extension of the original East End Poverty Map, which may broadly be said to have been dependent on a quantitative analysis of the poverty therein.

He began by making an enquiry for Mr. Booth into the trades of London, so that he had gained some experience of the wages of the people living and employed in different streets. Just about that time he had happened to meet Sir Edward Bradford, the then Head

of the Police, and had said to him that it appeared to him that the Police were possessed of a very special knowledge of the conditions of life of the poor as shown by the manner in which their earnings were spent at home, and that if possible it would be most valuable to tap this source of information. The result was that the Head of the Police asked him to come and see him at Scotland Yard and he would see what he could do to help by way of experiment. Mr. Booth approved of this plan, and for three years an ever-changing policeman who knew most about each little beat walked with Sir George through London, visiting every Court and Street. In the process full notes were taken and a colour suggested for every street. Others were also engaged in this work, but Mr. Booth said there must be one among them who would make himself conversant with all the streets, so that those represented as dark blue in South London should be comparable with the dark blue in the North. It was for this reason that Sir George had the astounding chance, not only of working under Mr. Booth's supervision, but also of visiting every street in London, and writing down something about it—giving a description of the people who lived there—and so getting in a sense a standard that could with assistance of someone with specialized local knowledge be applicable to any part of London, and also to any town in England.

Since Sir Hubert had been kind enough to invite him to help in the present enquiry, he had lately been walking around the poor areas in company with students from the School of Economics, discussing with them the signs of poverty and seeing again how far they compared with the quantitative analysis which was going on in the School itself. The outcome was astonishingly interesting; what the final result would be it was not for him to say.

Naturally, anyone as old as he himself was all the time struck with the differences between now and thirty-five years ago, when he first began to walk the streets. In the poor districts, owing to the greater regard given to outward appearance, it was more difficult now to mark with as great certainty the degree of poverty or well-being than it was in the earlier days. The streets were better paved; the houses were better looked after; the children were better nourished; and he had not yet seen any without shoes and stockings; they certainly were better dressed.

The other side of the picture was that which touched happiness. In the earlier enquiry the happiness of the child was a thing that had struck him very much in the poorer districts. But now, in going the round of what were called the slums—or slums which were now replaced by high so-called "model" dwellings, he was very doubtful whether the child was as happy as he used to be when the houses were one or two stories high, when more sky and more sun were visible, and when less regard was paid to outward appearance in the form of shoes and stockings. One saw children with shoes and, knowing the cost of shoe-leather, one wondered whether their feet were not being unduly pinched. There was not that jollity in the poor district, not the games in the street. The County Council was

building high buildings with admirable balconies all round, but one did not often see the child in cot or perambulator on those balconies. On the dark side of high buildings it was well known that the prevalence of rickets was far greater than on the sunny side. One noticed women on the balconies shaking carpets, and gossiping with one another, but the child of the present day appeared to be kept more indoors than it used to be, and would suffer accordingly. For this reason, judged by the standard of comparative happiness which Sir Hubert Llewellyn-Smith had pointed out would be considered in the new enquiry, and purely as a tentative conclusion based on an insufficient number of visits made up to the present, Sir George Duckworth was inclined to say rebuilding solely with a desire to rehouse people on the spot was not wholly in the ultimate interests of the health and intelligence of the child. This should not be. For the moment he was rather seriously alarmed lest that astonishing jollity, quick wit, and, on the whole, healthiness of the young London slum child might not be seriously affected by the charitable desire both of official charities and of municipalities to rebuild and rehouse on the spot in high model dwellings those who with the present increased facilities of locomotion might more properly be catered for on the outskirts of the metropolis.

MR. D. CARADOG JONES thought that Sir Hubert Llewellyn-Smith had refrained very wisely from giving any detailed results of the New Survey at this stage; he had contented himself instead with an account, admirably concise and interesting, of the way in which he, Professor Bowley and others, were facing and overcoming the difficulties of linking up the Old Survey with the new one. He was glad also to find in the paper so noble a tribute to the genius of Sir Herbert's great predecessor, and he thought statisticians should count themselves fortunate that the New Survey was in such exceedingly competent hands.

His own justification for speaking was that in Liverpool a parallel survey was being attempted, but if it required courage on Sir Hubert's part to take the Society into his confidence at this early stage of the New Survey in London, it would require even greater courage on his part to say much about the Liverpool survey, because it had only very recently begun. He had himself only definitely started work upon it less than three months ago. For this reason, and as the time was so far gone, he thought it would be unwise to intrude with any remarks about Liverpool on the present occasion; he would prefer to leave an opportunity for other speakers to discuss further the admirable paper which had been read that evening.

PROFESSOR A. L. BOWLEY thought that those present had already heard everything that could be usefully said at this stage of the progress and programme of the London Survey, and there was no time—and he had no desire—to inflict upon the meeting an account of the difficulties which had to be encountered in the part of the Survey in which he was closely interested. If Professor Jones had

not spoken of the sampling method he would have preferred not to introduce that subject here, but Professor Jones appeared to think investigators went haphazard into a house and asked the housewife whether she liked butter, wrote something down on a card, and called that an investigation. He could assure him that nothing of that sort happened. By now he and his assistants had had considerable experience as to what class of facts could, and what could not, be learned by house-to-house investigation, and the enquiry was confined in the first place just to those details on which, as anyone who had studied the former investigations would know, reasonably accurate information could be obtained. Further, although he fully appreciated as an onlooker the extraordinary difficulty and courage required to get into conversation with the housewife at a house where one had no concern, yet he would be lacking in his duty to a very large number of people who had collected information in this way if he did not say that they had the necessary courage, intelligence and tact to get into the house, not to waste their time, have a genial conversation with the householder, and come away with accurate information. Such a result was not always attained, but if Professor Jones would come across to the School of Economics he would be able to show him in what a large number of cases the investigators did succeed in getting information about which no doubt could be held, and which could be confirmed by other results. He had good reason to believe that the enquiry by sample had produced valuable results.

As it happened in London, the difficulty was not that of the character suggested at all; but arose from the pure theory of sampling. In that theory of sampling, the number entering into the sample was dominant, and influence of the number in the universe sampled was merely negligible. The whole thing depended upon being able to make an adequate definition of the items in the universe and an adequate method of choosing them; but it was found that there was rapidly increasing difficulty in defining the universe, and selecting the sample, as the size of the universe increased; so that investigating London by this method was less simple than investigating a provincial town. That, to him, was an interesting point, and naturally a great deal of attention was being paid to overcoming the difficulties met with.

Another point he would like to make was to emphasize what had already been said about the rising standard, in the sense that people now regard as poor those whom in a former enquiry would have been regarded as comfortable. No statistical investigation on this point was being made, and he was merely collecting opinions; but it would be found that there was very definite evidence of the rise in the standard of living and diminution in poverty, simply from the fact that the popular conception of what constituted poverty had changed.

SIR WILLIAM HAMER said that it had given him very great pleasure to be asked to try to do something to link up the present

Survey of London with the past one, for the reason that his former chief, the first Medical Officer of Health for the County of London, Sir Shirley Murphy, was always a devoted admirer of Charles Booth, and was wont to urge his assistant medical officers and inspectors to keep a watchful eye, in connection with all their enquiries, upon the colour of the streets as depicted in the well-known Poverty Map.

The linking up of past and present Surveys was a rather difficult task. It would be remembered that Dr. Farr thought that "great cities" would never be able to show death-rates comparable with those of the "country." What would he have thought of the recent mortality statistics of New York and London?

To take another example of the manner in which times had changed, London had its two thousand cases of typhoid fever annually about the time when Charles Booth's Survey was being completed; at that time, also, the healthy carrier hypothesis was just beginning to lift up its head. At the same date it was apparent that the cases of typhoid fever in London were occurring (almost without exception) among inhabitants of Charles Booth's light blue and purple streets. This was doubtless one of the reasons which prompted Shirley Murphy to remark, when he was urged to segregate carriers of bacilli, "If we are to segregate anybody we must segregate the sound."

Sir Hubert had said in his paper that long-period statistical enquiries presented innumerable difficulties and were full of pitfalls for the unwary, especially when "the available statistics had been modified" and "changes of circumstances and of social habits" had occurred. On the other hand, the fascination of the "long view" undoubtedly grew upon one as one grew old. Perhaps it was only then that it became really practicable to make direct comparison at first hand, so to speak, between the old and the new. In any case, he was very glad the Director of the present Survey was minded, in his endeavours to stimulate "the use of leisure," to urge him to renew his acquaintance with Charles Booth's seventeen volumes, and to resume at the same time the study of changes in practice with regard to notification and classification of disease.

MR. MARKHAM thought it was very evident from Professor Jones's remarks that he had not understood the way in which the London Survey was tackling the housing sample. Professor Jones had assumed that Booth's method of indirect sampling had been set on one side, but he thought it was true to say that the method of indirect sampling had been linked up with the house-to-house method. It was being done by persons who knew the district and the people very well, so that there was ease of entry and knowledge of local conditions.

MISS BUER said that she had had the privilege of helping Professor Bowley in the Reading enquiry, and would like to support what he said: that in that enquiry, with somewhat miscellaneous assistant investigators, they were successful in obtaining information

which was found to be extraordinarily accurate along certain lines where it could be tested. There were very few misstatements as to earnings, as to which in many cases it was possible to test the information obtained by reference to employers. There were practically no misstatements as to rent; there was not quite such a degree of certainty about the numbers of children, but there was no reason to suspect any gross inaccuracy, and a good deal of information was obtained about housing.

Success did, of course, depend very largely on the investigator, and all concerned with this enquiry would realize the necessity for having the right persons, and of testing the information on every possible point. Professor Bowley had said there were limits to this method, and personally she would not have applied it to Professor Jones's particular topic of enquiry. For instance, she feared she would not be able to tell what kind of butter was consumed in her own household.

Another point was that the poorer the household the easier it was to get information; her investigators in the poorest districts said that information was literally thrust upon them.

MR. FLUX said that if there were no others who wished to take part in the discussion, he would like to read a letter he had received from a former President of the Society, Mr. Udny Yule, who regretted that he had been unable to be present at the meeting, particularly in view of the nature of the matter under discussion. Unfortunately Mr. Udny Yule was far from well and dared not come up to town, however much he would have been gratified to have been able to do so. Mr. Flux then read the following communication :—

*St. John's College,
Cambridge.*

June 16th, 1929.

DEAR MR. PRESIDENT,

Please express to the reader of the paper and to the Fellows my apologies for absence from the meeting.

The name of Charles Booth will always remain one of the most honoured on the roll of the Society. In the New Survey his memory receives the highest tribute that can be given: the repetition, so nearly on the lines which he laid down, of that great work to which he, and the band of those who helped him, devoted so much time and labour. Their labour gave us a single, isolated picture. When the New Survey is completed, we shall have two; with all the additional interest which the possibility of comparison implies. I should like to join in the cordial expressions of good-will which, I am sure, will fall from others at the meeting and which you, Mr. President, will voice on behalf of the Society. It must add to the pleasure of Fellows that the description of the New Survey and its difficulties has been given them by one who took a part, to which he so modestly refers, in the Old Survey; and that they can join to the expression of their wishes for the complete success of that bodiless thing an

organization, a warm expression of their personal regard for the Director, and of their hope that he may see the New Survey carried through to its happy end.

Yours sincerely,
G. UDNY YULE.

The Vote of Thanks to Sir Hubert Llewellyn-Smith which had been proposed and seconded, expressing the best thanks of the Society for his admirable description of what was being done in connection with the New London Survey, was put to the meeting and carried unanimously.

In asking Sir Hubert to reply, Mr. Flux suggested that he might prefer to add a few notes to his paper when published in the *Journal* of the Society.

SIR HUBERT LLEWELLYN-SMITH: I am very grateful to you for the very kind way in which you have received my paper. I am particularly touched by Mr. Udny Yule's letter.

It would be the very worst return that I could make for your kindness if I were to inflict on you anything in the nature of comment or reply to the observations that have been made by various speakers, but if I do not attempt that to-night it is not to be thought that I have not noted them and valued them all. If, as your President suggested, anything occurs to me that might usefully be said, I will adopt his suggestion of appending a note to the paper when published in the *Statistical Journal*, but for the most part I shall let the seed germinate and, I hope, produce a crop in time. Various ideas have been thrown out to-day which will be most useful to my colleagues and myself in the arduous work that lies before us. I thank you all for the kind way in which you have received my paper.

As a result of the ballot taken during the meeting, the candidates named below were unanimously elected Fellows of the Society:—

Benjamin Archer.
John Angus Nelson, B Sc.

Popatlal Dahyabhai Kora
Herbert Geraint Williams, M Sc,
A M I C E.

MISCELLANEA.

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A NEW METHOD OF COMPARING THE PRODUCTIVITY OF CROPS ON ARABLE LAND IN ENGLAND AND WALES, SCOTLAND AND DENMARK.

By HARALD FABER,

Agricultural Adviser to the Danish Legation in London.

Introduction.

WHEN the great agricultural depression set in in the early 'eighties, English and Scottish agriculture was considerably more advanced than the agriculture of Denmark and was probably the most highly developed of all. "The general level of production from English land," according to Sir Daniel Hall (Address to British Association, Oxford, 1926), "was raised nearly 50 per cent. between 1840 and 1870," at a time when Danish farmers were still reducing the fertility of their land by growing and selling corn without much manuring, hardly any artificials and only a little natural manure, the number of live-stock being small. Led by the example of progressive owners of landed estates, many of whom had seen more modern practice in England and Scotland, where they particularly learned the advantage of growing roots, Danish farmers gradually changed over from corn-growing to dairy-farming, but for climatic reasons kept most of their land as arable.

A comparison of the production on arable land in England, Scotland, and Denmark during the last forty years shows that Great Britain was considerably ahead of Denmark by the year 1890, but that now the Danish farmer gets on the average more food out of his arable land, and that this is due to a very large extent to his growing of roots. During the years 1923-27 Denmark's crop of swedes alone, 10.4 mill. tons, was actually larger than the total crop of turnips and swedes in the whole of England (see App. II).

For the sake of international comparison the metric units seem preferable, wherefore I have re-calculated the statistical data as metric terms. I have examined four quinquennial periods, viz. 1889-93, 1899-1903, 1909-13 and 1923-27. The statistical material did not allow of an earlier period being included, while the abnormal conditions caused by the Great War made it unsafe to consider the years before 1923. For several reasons permanent pastures are left out of account and the comparison is only of the production of plant food on arable land.

In order to be able to compare the total production in different countries it is necessary to reduce the various crops to a common unit. Otherwise it is impossible to bring into the same calculation corn, roots and green crops. As roots and green crops are grown to be used as food for live-stock, and as it has been found by elaborate research during many years and by practice that roots and green fodder can replace corn in the food of live-stock in certain proportions, it is natural to make use of this experience in estimating the relative value of the different crops. It has been found that 1 kg. of barley has the same feeding value as 1 kg. of wheat, rye or pulse, but that 1.2 kg. of oats and 1.1 kg. of mixed corn are required to replace 1 kg. of barley in the food of live-stock in order to maintain the same production and live weight. One kg. of barley is taken as unit and called a food unit (f.u.). In the same way it has been found that 1 kg. of dry matter in roots is equivalent to 1 kg. of barley. It therefore depends on the percentage of dry matter in roots how many kg. of roots are required to make 1 food unit. Supposing, for instance, that mangels contain 12.5 per cent. of dry matter, then 8 kg. of mangels correspond to 1 f.u. Of hay $2\frac{1}{2}$ kg. have been found to have the same food value as 1 kg. of barley. Hay from grass and clover cut very young, during the beginning of the flowering season, may be of higher value, 2 kg. of such hay being equal to 1 kg. of barley. On the other hand, hay cut late when the grass seed is ripe, or even later, may be of such inferior quality that about 4 kg. of hay are required for 1 f.u. : $2\frac{1}{2}$ kg. are considered a fair average for the food value of good hay. Further details about food units will be dealt with as occasion arises.

When dealing with a very great number of food units it is practical to use a larger unit, therefore, 1,000 food units are designated as 1 crop unit (c.u.).

This method of estimating the value of different crops by converting them into food units in order to reduce the total produce to one single figure has been used for a number of years by the Statistical Department in Denmark, and enables one to see at a glance how one year's total harvest compares with that of others.

In the official report on the harvest in Denmark in the year 1925 are the following figures for the total harvests in Crop Units :

	Without Slesvig.	Including Slesvig.
1879-83	3,050,000	—
1899-1903	4,030,000	—
1919-23	5,420,000	5,800,000
1925	6,750,000	7,290,000

The final results of the present calculation seem to indicate that this method of estimation may be usefully employed also internationally. If you have to deal with both animal and vegetable produce the calorie would be a better unit, but for the harvest the food unit seems the more natural and the easiest to handle.

Corn Crops (Grain).

The calculation of the corn crops to metric units and to crop units offers no difficulty.*

As it would take up too much space to give all the details of the calculation I shall give only an example, viz. the calculation of the corn crops of England and Wales for the years 1889-93.

	Area. In 1,000 i a.	Yield.	
		1,000 Tons.	1,000 c.u.
Wheat	889	1,775	1,775
Barley	758	1,484	1,484
Oats	775	1,392	1,160
Rye	14	25	25
Pulse	207	371	371
	2,644 †	5,040 †	4,814 †

* When converting bushels to tons I have, for the periods 1889-93 and 1899-1903 used the following figures :

	lb. per Bushel.	
	England and Wales.	Scotland.
Wheat	61.81	61.35
Barley	53.70	53.36
Oats	39.34	40.66

For the period 1909-13 I have for each year used the figures given in *Agricultural Statistics*, 1913, II. p. 129, and in *Agricultural Statistics, Scotland*, 1913, II. p. 120.

In converting bushels of pulse a bushel is taken as 60 lb.

† The seeming discrepancy is due to the fact that the figures are abbreviated.

The difference between number of tons and number of crop units is due to the fact stated above, that it requires 1.2 ton of oats to make 1 c.u. equivalent to 1 ton of barley.

We have, then, for England and Wales, for 1889-93, the following data concerning the corn crops :

Area. 1,000 ha.	Yield. 1,000 tons.	Yield. 1,000 c u.	Yield. hkg. per ha.	Yield. 100 f.u. per ha.
2,664	5,046	4,814	19.0	18.1

The details required for these calculations will be found in Appendix I.

Thus we get the following figures showing the production of the total corn crops of the three countries in the four quinquennial periods dealt with.

TABLE I.
Corn Crops.

	Yield. 1,000 tons.			Crop Units. 1,000.		
	England and Wales.	Scotland.	Denmark.	England and Wales.	Scotland.	Denmark.
1889-1893	5,046	949	1,915	4,814	835	1,800
1899-1903	4,680	899	2,069	4,429	792	1,930
1909-13	4,490	922	2,289	4,256	810	2,127
1923-27	4,177	893	2,704	3,930	776	2,507

The corn crops comprised are for England-Wales and Scotland : Wheat, Barley, Oats, Rye, Pulse and, for the last period, Mixed Corn which previous to 1918 was included amongst the other corn crops. In England and Wales the crop of rye is partly cut as green fodder. In 1924 the proportion harvested as ripe corn was estimated for the first time in England and the amount of produce was also estimated. Roughly one-quarter of the area was cut green and three-quarters were harvested ripe, yielding 13.6 cwts. per acre, corresponding to 16.8 hkg. per hectare. It would therefore probably be approximately correct to include for each period three-quarters of the acreage under rye among the acreage under corn crops and to take the produce as 16.8 hkg. per hectare, and this has been done in the above table. The rye crop in Scotland, as in Denmark, is harvested ripe practically in its entirety.

The corn crops of Denmark comprise the same as above, Mixed Corn, an important crop, appearing in all four periods. The fast-

disappearing crop of Buckwheat is also given. The increase in the acreage in the period 1923-27 is caused by the inclusion of the part of Slesvig ceded to Denmark after the war.

The areas of the corn crops of England and Scotland have been gradually diminished and likewise the yields in tons. For the three first periods the area of corn crops of Denmark has diminished, but the yield in tons has nevertheless increased.

Taking the total areas under corn and the total yields, in hkg. and in food units, for each country and each period, we can calculate the yields of all grain crops together, as shown in the following table.

TABLE II.
Yields of corn in hkg. and in Food Units per ha.

			Hkg. per ha.			100 f.u. per ha.		
			England and Wales.	Scotland.	Denmark.	England and Wales.	Scotland.	Denmark.
1889-93	...	...	19.0	18.0	16.2	18.1	15.8	15.2
1899-03	...	...	19.4	17.7	17.8	18.3	15.6	16.6
1909-13	...	...	19.3	18.9	20.0	18.3	16.6	18.5
1923-27	...	...	19.7	19.3	21.2	18.5	16.8	19.6

It appears that there has been a slight increase in the case of England and Wales, a larger increase in the case of Scotland, but a much larger increase in the Danish yields, which during the first period were considerably behind.

Root Crops.

The root crops comprised are, for England and Wales and for Scotland: Potatoes, Mangels, Turnips, Swedes, Carrots also, Sugar beets, for the last two periods in England and the last period in Scotland. For Denmark: the same, including Sugar beets for all four periods and Chicory roots for the last three periods. The yields, where not published in the statistical tables, have kindly been given me by the respective Ministries.

The factors used in converting yields in tons to yields in food units or crop units will require some explanation. According to the Danish Statistical Department, 100 kg. potatoes correspond to 23.75 f.u. As no other proportion is known to be more suitable for Great Britain, this factor is used throughout. The average percentages of dry matter in roots have been given annually in the Danish agricultural statistics since 1904. They were, on the average of the years 1904-13, about: Mangels 12.5, Swedes 12.2,

Turnips 9.5. That is the same as to say that, for instance, 100 kg. mangels correspond to 12.5 f.u., and so on. These factors are used for the two periods 1899-1903 and 1909-13, but for 1889-93 I have used the factors 12, 12 and 9, respectively, for the following reason. Since 1889 a great amount of work has been done in Denmark, initiated by the late L. Helweg, and, since 1898, led by the Government Experimental Stations, with the object of obtaining strains of roots with a maximum yield of food-stuff per ha.* This resulted during the first decades in bringing out strains with a rather higher percentages of dry matter. Therefore I have taken somewhat lower factors for the period 1889-93.

No information of the average content of dry matter in roots in Great Britain being available, I have assumed the percentages to be respectively 12, 12 and 9 for all four periods, but I am inclined to think these figures are high. The tendency in Great Britain is towards large roots and a large yield of roots in a given area. This generally means a low percentage of dry matter in the roots. The tendency in Denmark has been to produce as great a yield of dry matter per hectare as possible. That for many years resulted in the preference of high-percentage roots, even if the roots were smaller and the yield of roots per hectare also smaller.

Of late years there seems to have been in Denmark a tendency towards strains with slightly larger roots, but with somewhat lower percentage of dry matter, provided, however, that they gave a large amount of dry matter per hectare. The different strains, when finally judged, are always arranged in the reports according to the yield of dry matter per hectare. The seven best strains of mangels (Barres) tried during four years' research (1920-23) gave :

	Hkz. of dry matter per ha.	Hkg. of roots per ha.	Per cent. of dry matter.
Taarøje, Lyngby VI	82.8	727	11.4
Taarøje, Trifolium VI	82.3	726	11.3
Strynø VI	81.9	735	11.1
Ferritslev VI	80.9	692	11.7
Sludstrup, Hind. VI	80.5	641	12.6
Sludstrup, Hulby VI	80.3	623	12.9
Røsted, Roskilde VI	79.8	663	12.0

As the Taarøje strains, with a larger yield of roots and lower percentage gave a larger total yield of dry matter per hectare than the high-percentage Sludstrup strains, the first have been preferred and have taken the place of the others, which used to be favourites.

This has resulted in a lower average percentage of dry matter in

* See Faber, *Forage Crops in Denmark*, 1920, Longmans, Green & Co.

the mangel crop in Denmark. In the last years' agricultural statistics the following percentages are given (1923-27): Mangels 11.3, Swedes 12.0 and Turnips 9.2. It will be noticed that the percentages of dry matter in Swedes and Turnips are also somewhat reduced. The climatic conditions may be partly responsible, but also the use of more nitrogenous manures, which produce larger roots but with a lower percentage of dry matter.

These figures are therefore used in calculating the yields in food units or crop units of the Danish root crops in 1923-27.

Between 1900 and 1908 eight selected English strains of mangels were tried by Helweg, together with 163 Danish mangels (Barres). The English strains were found to contain on an average 0.5 per cent. less dry matter than the average of the Danish strains. In 1920-21 three selected English strains of mangels were tried, together with nineteen Danish strains of Barres. For particulars see Appendix III. The English strains were among those that gave the smallest yields of dry matter per hectare of the twenty-two strains compared, and they had the lowest percentages of dry matter in the roots, but they gave fairly large yields of roots per hectare. On an average the Danish strains had a percentage of dry matter of 12.0, and the English 11.0.

Two strains of Danish swedes were cultivated at Newton Rigg with fourteen English strains, and the former were found to contain nearly 0.8 per cent. more dry matter than the latter, the averages being for the fourteen English strains 10.07, and for the two Danish 10.85. Twenty English and Scottish strains of swedes were tried by Helweg in Denmark between 1900 and 1916, and were found to contain 12 per cent. dry matter against 12.2 in the twenty-eight Danish strains. Recently three Danish varieties of swedes were tried in Glamorgan and Monmouthshire in comparison with "Best of All" and the farmer's own variety at each centre. It was found by the Bangor College that the content of dry matter in the Danish swedes was higher than in the English, and the former were also more resistant to finger-and-toe disease.

Owing to the paucity of information about the content of dry matter in British roots I have had to choose factors for converting the yields of roots into yields of dry matter. In choosing 12, 12 and 9 for mangels, swedes and turnips I feel that I am being liberal. I have used these factors during all four quinquennial periods.

But a considerable difficulty is encountered in the fact that the acreages and yields of swedes and turnips are not stated separately for Great Britain. It is true that both are crucifers, but the fact that swedes contain 33 per cent. more dry matter than turnips would seem, if fully appreciated, to make it desirable to distinguish

between them, as is done in Denmark. I have made several unsuccessful attempts to obtain some guidance as to the relative importance of these two crops in Great Britain. I had hoped to obtain from some of the large firms of seed merchants an indication of the relative quantities of seeds of the two kinds sold. Only one well-known firm in Scotland favoured me with the desired information. It is unfortunately indispensable to make a guess at the proportion of swedes and turnips cultivated, in order to calculate the yields in food units or crop units. In the absence of any better information I have considered it fairly reasonable to assume that half the yield in England is of swedes and half of turnips, while for Scotland I assume that two-thirds are of swedes and one-third of turnips. Taking then 12 as the percentage of dry matter in swedes and 9 as the percentage in turnips, we find that 100 kg. of swedes and turnips correspond to $10\frac{1}{2}$ food units in England and Wales and to 11 food units in Scotland. The figures in Appendix II seem to confirm the assumption that swedes are the predominant crop in Scotland. If one may be guided by the Danish yields, swedes give a relatively larger yield in tons per hectare than turnips. The yields in Scotland are seen to be greater than in England, and that may very well be caused by Scotland growing a larger proportion of swedes than England.

Carrots are estimated as having 12 per cent. of dry matter, like mangels.

Sugar beets and Chicory roots are estimated to contain 25 per cent. of dry matter, making 4 kg. roots correspond to 1 food unit.

The following table has been calculated by using the above-mentioned factors and the figures given in Appendix II.

TABLE III.

Root Crops.

	Yield. 1,000 tons.			Crop Units. 1,000.		
	England and Wales.	Scotland.	Denmark.	England and Wales.	Scotland.	Denmark.
1889-93	28,548	8,410	2,889	3,411	1,032	398
1899-1903	25,447	7,652	6,596	3,073	924	875
1909-13	26,375	8,598	13,583	3,221	1,052	1,797
1923-27	21,155	7,628	20,630	2,815	954	2,404

The most striking feature of Table III is the very large increase in the acreage and yield of roots in Denmark, and, as seen from the

details in Appendix II, especially of swedes, which to some considerable extent have replaced turnips, thereby increasing the yield as measured in crop units. The area and the yield have, on the other hand, decreased somewhat in Scotland and considerably so in England. As the yield in crop units per hectare from roots, and especially mangels and swedes, is between two and three times as great as from corn or any other crop (excepting perhaps the best permanent pastures in Great Britain), this great increase in the cultivation of roots in Denmark has, as will be seen in the final results, materially helped to increase the total production and the production per hectare of food-stuff (crop units) in that country.

If we take for each country the total area under roots of all kinds and the total yield of all roots we can calculate the yields in tons per hectare of all roots and the yields in food units. The result is stated in Table IV.

TABLE IV.

Yields of Roots in Tons and in Food Units per hectare.

	Tons per ha.			100 f.u. per ha.		
	England and Wales.	Scotland.	Denmark.	England and Wales	Scotland.	Denmark.
1889-93	31.9	33.2	24.9	38.1	40.8	34.3
1899-1903	30.9	31.8	31.1	37.3	38.3	41.3
1909-13	33.1	36.3	39.3	40.4	44.4	51.9
1923-27	30.1	34.8	43.0	40.0	43.6	50.2

While there has been no increase in the yield in tons in England and only a small increase in Scotland, both countries show a small increase in food units. As far as concerns England, this is explained by the increased cultivation of potatoes and sugar beet and the reduced area of turnips and swedes. It will be noticed that Denmark was, in 1889-93, considerably behind the other countries, but in 1923-27 considerably in advance, the yield per hectare in tons and in food units having increased by 73 per cent. and 46 per cent. respectively.

Having calculated, for Tables I and III, the areas in 1,000 hectares, and the yields in 1,000 crop units, of corn crops and root crops, these items can be added together, for each country and each period, whereby we arrive at the following results :

TABLE V.
Corn Crops and Root Crops together.

	Yields in 1,000 Crop Units.			Yields in 100 f.u. per ha.		
	England and Wales.	Scotland.	Denmark.	England and Wales.	Scotland.	Denmark.
1889-93	8,225	1,867	2,198	23.1	23.9	16.9
1899-1903	7,502	1,716	2,805	23.2	22.9	20.4
1909-13	7,477	1,862	3,924	23.9	25.6	26.3
1923-27	6,745	1,730	4,911	23.9	25.4	28.0

The total area of corn and root crops has been reduced in England and Wales, and to a somewhat smaller extent in Scotland, but steadily increased in Denmark, during the last period partly by the inclusion of part of Slesvig. The yield in crop units has declined in England and to a smaller extent also in Scotland, while in Denmark it has increased by nearly 125 per cent., due partly to an extension of area and to the increased yield per hectare of both corn and roots, but mostly to an increase in the cultivation of roots.

The table also shows the yields in 100 food units per hectare. These increased slightly in the case of England and Wales, and of Scotland, but while Denmark during the first period was behind, she forged ahead, the yield in food units per hectare during the last period being 66 per cent. above that of the first period.

Green Crops.

The agricultural statistics of Great Britain and of Denmark deal in a somewhat different manner with the green crops. For that reason it will be necessary to take the countries separately. The permanent grass is, as already explained, excluded from this calculation.

The green crops in England and Wales, and Scotland are : clover and grass in rotation, for hay or not for hay; cabbage, kohlrabi and rape; rye and vetches; lucerne; of rye is taken only the area in England which is cut green. The areas are for the four periods in hectares :

For England and Wales : 1,403,606; 1,457,544; 1,184,032; 1,145,861
For Scotland : 670,664; 656,517; 615,760; 618,758

The Danish areas included are those which are officially known as Clover and grass in rotation, Green crops, "Cultivated fallow," "Half fallow," and Lucerne. "Cultivated fallow" or "areas in the Fallow which were seeded," either with oats and vetches or with

turnips, correspond to what in English would be described as "catch crops." "Half fallow" is the last year's rotation grass, in earlier periods probably the fourth year's, now generally the second or third year's, which is ploughed up in July-August to make room for winter corn. This grass land is only available for cutting or, more often, grazing for about three to four months. The catch crops are likewise ploughed up in July-August to make room for winter corn and are therefore not grown to ripeness.

The estimation of these crops, in yields of food units, is naturally very difficult and undoubtedly the weakest link in this calculation. But it is unavoidably necessary for the purpose of this paper to make the best possible estimation. After consulting the best experts available I have been led to make the following estimation.

The only crop which is gathered, the quantities harvested being stated in the official statistics, is the hay crop.

Taking $2\frac{1}{2}$ kg. of hay to have the same food value as 1 kg. of barley, or, in other words, taking $2\frac{1}{2}$ kg. hay as equal to 1 food unit, the amount of food units in the hay crops can be calculated. After the hay is cut the fields are used for grazing. The quantity of fodder thereby obtained is, as far as Denmark is concerned, estimated at 50 per cent. of the quantity obtained as hay. In this way we find the number of food units, total and per hectare, obtained from the acreage of rotation clover and grass used for hay. Table VI gives the figures in the first three columns of the hay crops as such, and, in the last column of the amount of food units obtained per hectare partly as hay and partly as pasture after hay cutting. The figures in col. 4 are obtained from the figures in col. 3 by first adding 50 per cent. and then dividing by 2.5.

TABLE VI.
Yields of Rotation Grass for Hay, Denmark.

	Ha.	Tons.	Hkg. per ha.	100 f. u. per ha (including grazing).
1889-93	212,380	643,380	30.3	18.18
1899-1903	264,890	911,960	34.4	20.64
1909-13	252,300	1,080,960	42.8	25.68
1923-27	250,930	1,337,300	53.3	31.98

The areas of all green crops in Denmark are estimated as in Table VII. As the areas are not stated in the statistics for each year, and as the classification varies to some extent from one statement to the next, there is some uncertainty about these figures, but I give them as nearly as I can.

TABLE VII.
Green Crops in Denmark.

	1889-93.	1899-1903.	1909-13.	1923-27.
	Ha.	Ha.	Ha.	Ha.
Rotation Grass :				
for Hay	212,380	264,800	252,300	250,930
not for Hay	622,680	483,400	475,400	460,770
Green Crops	23,720	22,830	24,860	22,610
Catch Crops	24,130	34,530	44,010	— *
Half Fallow	59,020	62,670	71,620	55,800
Lucerne	210	3,100	9,170	28,410
Total	942,140	871,420	877,360	818,520

* Included in other areas.

The yields in food units obtained from these areas are estimated as follows :

The yield of rotation grass used only for grazing is estimated as 80 per cent. of that of the same area if used for both hay and grazing. This estimation may be fairly correct for the last two periods, but in earlier years, when the rotation grass was left for a longer time, it is probably too high, and 70 per cent. is likely to be more correct. We take, for example, 70 per cent. of the area in 1889-93, 622,680 and multiply with the yield of food units per hectare for the same period, as given in Table VI, viz. 18, 18, and thereby obtain, as the yield in crop units of the rotation grass not for hay, 792,420 crop units.

In the same way we calculate from the area given in Table VII and the yields given in the last column in Table VI, but reducing the yields from the different crops in proportion to the yields of rotation grass for hay as follows :

Rotation grass not for hay	70 or 80% (as already stated).
Green Crops	60%
Catch Crops	60%
Half Fallow	50%
Lucerne	150%

This calculation gives us the figures in Table VIII, where the yield from rotation grass for hay (and grazing) is also given.

With regard to the estimation of the green crops in England and Scotland, I have had very valuable assistance from several experts. As far as rotation grass is concerned, there is a general consensus of opinion that 2½ kg. of hay may be taken as one food unit, that the aftermath after hay cutting will yield about 50 per cent. of the hay, and that the rotation grass not used for hay yields in England about

TABLE VIII.
Yields in Crop Units of Green Crops in Denmark.

	1889-93.	1899-1903.	1909-13.	1923-27.
Rotation Grass :				
for Hay	386,030	547,180	648,580	802,380
not for Hay	792,420	698,410	976,660	1,031,730
Green Crops	25,870	27,450	38,300	43,380
Catch Crops	26,320	42,760	67,810	—
Half Fallow	53,050	64,680	91,960	88,900
Lucerne	580	9,600	35,350	136,080
Total ¹	1,284,870	1,390,080	1,858,660	2,102,470

80 per cent. of the yield of hay and aftermath, but only 70 per cent. in Scotland, where the rotation grass is left for several years.

I have experienced more difficulty in my attempts to estimate the other green crops, but I have been fortunate enough to obtain from Professor Jas. A. S. Watson, School of Rural Economy, Oxford, some suggestions which I have been glad to adopt. Professor Watson suggests that the yields of "cabbage, kohlrabi and rape" be compared with that of turnips and swedes, cabbage yielding rather larger food value than turnips and swedes, kohlrabi rather less and rape considerably less. For England it is suggested that 80 to 90 per cent. of the food value yielded by turnips and swedes would be a reasonable yield for cabbage, kohlrabi and rape, while for Scotland, where the acreage of cabbage is small, that of kohlrabi negligible, and that of rape very considerable, 60 per cent. would be a fair estimate. I have taken 85 per cent. for England and Wales. Professor Watson has estimated the yield of rye and vetches at 60 per cent. of the yield of rotation grass cut for hay, taking the hay and aftermath together. As this is the same as suggested by Danish experts and used in Table VIII, I am adopting it in the following calculations.

TABLE IX.
Hay Crops.

	England and Wales.			Scotland.		
	Hk.	Tons.	Hkg. per ha.	Hk.	Tons.	Hkg. per ha.
1889-93	734,570	2,492,377	33.9	162,330	612,337	38.3
1899-1903	768,517	2,745,505	35.7	166,300	659,488	40.0
1909-13	661,100	2,353,605	35.6	170,860	672,126	39.3
1923-27	684,170	2,568,468	37.5	165,620	689,070	41.6

Table IX gives the areas of rotation grass for hay, the yields in tons, and the yields in hkg. per hectare. The total number of food units yielded per hectare is calculated from the number of hkg. per hectare by adding 50 per cent. and dividing by 2.5, as was done when calculating column 4 in Table VI. From the figure obtained thereby and the number of hectares the number of crop units is calculated.

From Appendix II I take the yields of tons per hectare of turnips and swedes, for England and Wales and for Scotland. These I re-calculate to 100 food units per hectare by assuming, as explained in the chapter on root crops, that turnips and swedes in England contain $10\frac{1}{2}$, and in Scotland 11 per cent. of dry matter.

In this way we obtain the figures in Table X.

TABLE X.
Yields in 100 Food Units per ha.

	Clover and grass in rotation, for hay.		Turnips and swedes.	
	England.	Scotland.	England.	Scotland.
1889-93	20.3	23.0	35.3	41.8
1899-1903	21.4	24.0	31.2	39.4
1909-13	21.4	23.6	34.4	46.5
1923-27	22.5	25.0	33.9	46.0

TABLE XI.
Yields in Crop Units of Green Crops in England and Wales.

	1889-93.	1899-1903.	1909-13.	1923-27.
Rotation Grass :				
for Hay	1,495,426	1,647,303	1,412,163	1,541,080
not for Hay	840,030	910,735	662,510	616,536
Cabbage, Kohlrabi, Rape	176,657	183,598	182,651	156,177
Rye and Vetches	104,456	89,186	64,162	58,531
Lucerne	22,812	58,916	75,486	72,947
Total	2,639,381	2,889,758	2,396,972	2,445,271

Yields in Crop Units of Green Crops in Scotland.

Rotation Grass :				
for Hay	367,402	395,693	403,276	413,442
not for Hay	804,404	807,352	720,949	773,098
Cabbage, Kohlrabi, Rape	8,826	13,404	13,928	18,975
Vetches	7,135	5,299	4,942	6,731
Lucerne	17	8	12	8
Total	1,187,784	1,222,256	1,143,107	1,212,254

From these figures together with the figures for areas we obtain, by using the estimates above explained, the yields in crop units in Table XI. Lucerne is estimated to yield 150 per cent. of the amount of food yielded by clover and grass for hay.

Straw.

In dealing with the corn crops, only the yields of grain have been so far considered. But it is necessary to take the straw into account. In the agricultural statistics the yield of straw was first enquired into in connection with the harvest of 1905, and since 1906 the yields, in cwt. per acre, of the straw of wheat, barley, and oats have been stated annually. By converting the yields of cwt. per acre into hkg. per hectare, and multiplying by them the area in hectare in Appendix I, the quantity of straw, in metric tons, is arrived at. This can be done, however, only for the last two periods. For the previous periods I have taken the average yields of 1909-13. The British statistics give no yields for pulse, rye or mixed corn. For these I have therefore assumed that it would be near enough if I use the yields as given in the Danish agricultural statistics.

This has been done for England and Wales and for Scotland, and the details of the calculations are given in Appendix IV.

The Danish agricultural statistics give the harvest of all kinds of straw from 1897, which enables us to calculate the total harvest of straw for the last three periods. For the first period it has been necessary to estimate it, which has been done in this way. For the two periods 1893-99 and 1909-13 is calculated the average yield of straw per 1,000 tons of grain. Multiplying the total yield of grain in 1889-90 by the factor so found, we arrive at an estimate of the harvest of straw which is probably somewhat near the correct one, or at all events is sufficiently accurate for our present purpose.

These different assumptions and estimates may seem somewhat arbitrary, but it will be easy to show that the final result is only very slightly affected whether a somewhat lower or a somewhat higher estimate is made in the yield of the different kinds of straw. And it might even be argued that the statistical data, even when forthcoming, are themselves only approximations. The following consideration will confirm this opinion.

The yields of straw were in Denmark formerly obtained by the reports of the local authorities, which were tested by reports from a number of farmers in each district, based on the actual weights of the crops after the harvest. This is the usual way of arriving at the result of the harvest. But during 1923-27 a different method has been used when estimating the yield of straw, giving a somewhat higher result. This method, based on the advice of agricultural experts,

is as follows. From all the many experimental plots of the local agricultural societies all over the country the weights of grain and weights of straw are ascertained, and from them the proportion between them calculated for each district. The yield of straw in these experimental plots is considered to be above the average, but the proportion between grain and straw in these plots is considered to be equal to the average proportion in the district. The proportions or factors for each district multiplied by the yield of grain for the district found in the usual way give the yield of straw for the district.

The average annual yield of straw in 1923-27, calculated by the new method, is 808,000 crop units. But if calculated by the factor (the proportion between grain crops and straw crops) obtained from the grain crops and straw crops in 1903-13 it would be only 653,000 crop units, considerably less. The effect of adopting 653,000 crop units as the straw yield in 1923-27 instead of 808,000 would be to lower the final figure given in Table XV from 3,060 f.u. per hectare to 3,000 f.u., which, it will be noticed, does not materially alter the deductions to be drawn from Table XV.

The yields of straw are, like all the other yields, to be converted into crop units. It is considered that 6 kg. of straw make one food unit, or that 6 tons of straw make one crop unit. We therefore obtain the values given in Table XII.

TABLE XII.
Yields of Straw in Tons and Crop Units.

				1,000 tons.			1,000 c.u.		
				Eng'land.	Scotland.	Denmark.	England.	Scotland.	Denmark.
1889-93	...	...	...	7,335	1,665	2,680	1,256	278	447
1899-1903	...	...	...	6,521	1,617	2,781	1,087	270	463
1909-13	...	...	...	6,342	1,529	3,516	1,037	255	586
1923-27	...	...	...	5,351	1,452	4,848	892	242	808

Fallow.

When calculating the total yield of food-stuff on the arable land, expressed in food units per hectare, it is necessary to include the fallow land in the area. This was, according to the official statistics, in hectares :

TABLE XIII.
Bare Fallow in ha.

					England.	Scotland.	Denmark.
1889-93	...	...	...	...	191,660	4,404	195,169
1899-1903	...	...	...	...	129,526	2,811	146,712
1909-13	...	...	...	...	130,727	2,775	135,328
1923-27	...	...	...	...	109,604	2,888	46,725

The very small area of fallow in Scotland is remarkable. The fallow in Denmark in 1889-93 was very large and shows the somewhat old-fashioned system then in vogue. Particularly by the extension of the area in roots the fallow was gradually reduced, and was in the last period less than one-quarter of the area in the first period.

Total Areas and Total Crops.

We have now all the material, such as it is, necessary for calculating the final result, which should show us *the average total production of food from the arable land in the three countries during the four quinquennial periods under consideration, expressed as food units per hectare.*

TABLE XIV.
All Acreages and Crops.

		Acreages. 1,000 ha.			Units of Crop. 1,000.		
		England.	Scotland.	Denmark.	England.	Scotland.	Denmark.
1889- 1893	Corn ...	2,664	528	1,186	4,814	835	1,800
	Roots ...	896	253	116	3,411	1,032	398
	Green Crops	1,404	671	942	2,639	1,168	1,285
	Fallow ...	192	4	193	—	—	—
	Straw ...	—	—	—	1,256	278	447
	Total ...	5,155	1,456	2,439	12,121	3,333	3,930
1899- 1903	Corn ...	2,416	509	1,165	4,429	792	1,930
	Roots ...	823	241	212	3,073	924	850
	Green Crops	1,458	657	871	2,890	1,222	1,390
	Fallow ...	130	3	147	—	—	—
	Straw ...	—	—	—	1,087	270	463
	Total ...	4,826	1,409	2,395	11,479	3,208	4,634
1909- 1913	Corn ...	2,329	489	1,147	4,256	810	2,127
	Roots ...	798	237	346	3,221	1,052	1,797
	Green Crops	1,184	616	877	2,397	1,143	1,859
	Fallow ...	131	3	135	—	—	—
	Straw ...	—	—	—	1,057	253	586
	Total ...	4,442	1,344	2,505	10,931	3,259	6,368
1923- 1927	Corn ...	2,123	463	1,277	3,930	776	2,507
	Roots ...	704	219	479	2,815	954	2,008
	Green Crops	1,146	619	819	2,445	1,212	2,102
	Fallow ...	170	3	47	—	—	—
	Straw ...	—	—	—	892	242	808
	Total ...	4,142	1,303	2,621	10,082	3,184	8,026

From the previous tables we gather the total areas and the total yields in crop units or 1,000 food units. These figures are collected and added up in Table XIV. As the table gives abbreviated figures the totals do not always agree.

By dividing the numbers of hectares into the numbers of crop units we obtain figures which can most conveniently be expressed in hundreds of food units per hectare. The calculation has been made by using the figures unabbreviated.

TABLE XV.

Average Yields from total Arable Land, in 100 f.u. per ha.

	England and Wales.	Scotland.	Denmark.
1889-93 	23.5	22.9	16.1
1899-1903 	23.8	22.8	19.3
1909-13 	24.6	24.2	25.4
1923-27 	24.3	24.4	30.6

Table XV shows that the yields from the total arable land have increased in England and still more in Scotland during the last forty years, but that the yields in Denmark have increased in a very much greater proportion. From being forty years ago about 30 per cent. below those of Great Britain they are now more than 25 per cent. above. In fact, not until well into the present century was Danish agriculture sufficiently developed to equal, as far as arable cultivation, that of Great Britain, which for a long time had been far ahead.

The reasons for this development in Danish agriculture are several. The great reduction of the fallow land, particularly of late years, is one of them. Increased yields of corn, roots and rotation grass is another, but the chief reason is undoubtedly the remarkable increase in the growing of root crops. And not only are roots grown to a much greater extent, but the growing of roots with a high percentage of dry matter, mangels and particularly swedes, has increased, while the acreage of the less productive turnips has actually decreased of late. The increased yields of both corn, roots and rotation clover and grass are due to a considerable extent to the selection of seeds of superior strains, greatly assisted by the work of the Government Experimental Stations, which have themselves evolved some of the strains and which offer to farmers reliable guide in the choice of strains. The work of the Government Seed Testing Station, especially the so-called "automatic control" (described in my book *Forage Crops in Denmark*), has been of great

benefit to Danish farmers. "It is safe to say," writes the director, "that there is no other country in the world where the control of seed used by the farmers is so extensive and so careful"—and, he might have added, where farmers make so much of the opportunities offered them. To this must be added that the gradually and largely increased number of cattle and pigs have made increased quantities of natural manure available for the arable land, supplemented by about 600,000 tons of artificial manures annually during the last years.

Other reasons might be mentioned, such as better methods of cultivation, more effective protection against plant diseases, and so on. But, as already stated, the chief reason has undoubtedly been the increased cultivation of roots made necessary by the increased number of live-stock.

APPENDIX I.

Corn Crops.

Acreage in ha. and Produce in 1,000 kg.

	England and Wales.			Scotland.			Denmark.		
	Ha.	1,000 kg.	Hkg. per ha.	Ha.	1,000 kg.	Hkg. per ha.	Ha.	1,000 kg.	Hkg. per ha.
<i>Wheat.</i>									
1889-93 ...	888,680	1,774,761	20.0	22,690	56,294	24.8	43,231	110,420	25.5
1899-1903...	707,545	1,495,893	21.1	17,898	45,908	25.7	34,568	95,910	28.6
1909-13 ...	703,770	1,559,850	22.2	21,154	63,741	30.1	50,088	148,200	29.7
1923-27 ...	648,540	1,417,170	21.9	22,437	58,539	26.1	86,924	233,322	26.7
<i>Barley.</i>									
1889-93 ...	758,410	1,483,843	19.6	87,970	188,915	21.5	291,190	508,333	17.5
1899-1903...	635,674	1,345,420	19.7	92,046	195,551	21.2	267,319	526,660	19.7
1909-13 ...	612,309	1,181,444	19.3	80,642	168,669	20.9	242,175	511,500	22.5
1923-27 ...	498,210	968,969	19.4	66,853	123,790	21.8	304,817	737,079	24.2
<i>Oats.</i>									
1889-93 ...	795,060	1,391,611	17.5	407,670	683,960	16.8	431,050	597,140	13.9
1899-1903...	844,226	1,502,164	17.8	391,024	641,056	16.4	427,819	690,830	16.2
1909-13 ...	812,061	1,406,333	17.3	380,974	677,231	17.8	420,516	779,600	18.5
1923-27 ...	708,800	1,436,074	18.7	379,370	703,097	18.5	438,497	906,555	20.7
<i>Pulse.</i>									
1889-93 ...	207,414	371,494	17.9	6,575	14,141	21.5	14,253	24,440	12.3
1899-1903...	162,960	305,706	18.8	5,265	12,121	23.0	9,043	12,400	13.7
1909-13 ...	186,134	317,646	17.1	3,544	8,775	24.8	5,232	8,700	16.6
1923-27 ...	142,860	235,392	16.7	1,140	3,191	28.0	7,426	12,675	17.0
<i>Rye.</i>									
1889-93 ...	14,260	24,636	(16.8)	3,241	5,133	(16.8)	284,530	491,790	17.3
1899-1903...	15,520	27,333	(16.8)	2,365	3,963	(16.8)	275,233	474,210	17.2
1909-13 ...	14,460	24,983	(16.8)	2,397	4,018	(16.8)	247,035	446,400	18.1
1923-27 ...	15,833	26,628	16.8	2,200	3,688	16.8	205,401	318,731	15.4
<i>Mixed Corn.</i>									
1889-93 ...							103,050	168,370	16.3
1899-1903...							140,074	237,680	18.4
1909-13 ...							178,340	359,300	20.2
1923-27 ...	48,518	90,250	18.6	555	1,128	20.3	231,530	494,750	21.3
<i>Buckwheat.</i>									
1889-93 ...							18,573	14,324	7.7
1899-1903...							10,922	8,188	7.5
1909-13 ...							3,333	2,480	7.4
1923-27 ...							1,866	1,801	9.7

APPENDIX II.

Roots.

Acreage in ha. and Produce in metric tons.

	England and Wales.			Scotland.			Denmark.		
	Ha.	Tons.	Tons per ha.	Ha.	Tons.	Tons per ha.	Ha.	Tons.	Tons per la.
<i>Potatoes.</i>									
1880-93 ...	180,444	2,410,002	15.0	57,675	837,802	14.5	52,300	443,800	8.5
1899-1903 ...	172,858	2,423,020	14.0	52,317	744,073	14.2	58,843	591,910	11.0
1900-13 ...	177,098	2,710,327	15.4	59,134	943,932	16.0	59,787	940,000	14.1
1923-27 ...	196,310	2,044,491	15.0	57,180	886,036	15.5	75,777	932,355	12.3
<i>Mangels.</i>									
1889-93 ...	138,770	6,088,837	43.9	475	19,880	41.9	22,923	1,003,366	43.8
1899-1903 ...	156,023	7,937,547	50.9	1,030	52,792	51.3	50,281	2,092,380	41.6
1900-13 ...	176,881	8,674,239	49.0	867	43,507	50.2	85,916	4,414,600	51.4
1923-27 ...	115,340	7,003,563	48.2	810	22,745	41.8	105,233	5,698,658	51.2
<i>Turnips and Swedes.</i>									
1889-93 ...	501,080	19,864,029	33.6	193,910	7,545,244	38.9	25,591	901,082	38.2
1899-1903 ...	466,161	14,519,358	29.7	187,758	6,728,412	35.8	56,140	2,038,410	36.3
1900-13 ...	439,100	14,403,994	32.8	176,711	7,472,384	42.3	68,159	2,788,500	40.2
1923-27 ...	322,450	10,412,911	32.3	180,160	6,689,241	41.8	57,124	2,463,357	43.0
<i>Turnips.</i>									
1889-93 ...							3,779	180,071	11.7
1899-1903 ...							20,601	1,271,190	15.0
1900-13 ...							96,693	1,551,000	17.1
1923-27 ...							200,879	10,423,571	51.9
<i>Swedes.</i>									
1889-93 ...							7,312	199,635	27.2
1899-1903 ...							14,171	298,250	26.7
1900-13 ...	735	17,618 (18.2)					26,210	768,500	30.1
1923-27 ...	35,514	663,437 (18.2)		1,270	18,000 (11.3)		36,146	999,031	27.5
<i>Carrots.</i>									
1889-93 ...	5,282	194,870 (35)		415	7,055 (17)		6,131	172,528	28.1
1899-1903 ...	4,400	168,000 (35)		310	3,370 (17)		6,959	200,920	28.8
1900-13 ...	4,310	150,550 (35)		218	3,706 (17)		8,089	236,340	28.0
1923-27 ...	3,729	128,461 (34.5)		187	2,329 (17)		3,563	96,861	27.2
<i>Chicory Roots.</i>									
1889-93 ...									
1899-1903 ...							792	11,808	18.8
1900-13 ...							952	20,520	20.9
1923-27 ...							731	11,150	19.4

APPENDIX III.

Extract of Report No. 175 from the Danish Committee on Plant Research on the Government Research Stations.

Comparative Cultivation of Strains of Mangels and Swedes, 1920-23, published 1924.

These trials were carried on at six different stations. Three English strains of mangels were compared with the nineteen Danish

strains entered. The result of the first two years' comparison is given as follows.* (Here abbreviated.)

	Hkg. dry matter per ha.	Hkg. roots per ha.	Per cent. dry matter	Name.
1	83.3	742	11.2	Taaroje, Lyngby VI.
2	83.6	736	11.4	Taaroje, Trifolium VI.
3	82.4	735	11.2	Stryne VI.
4	82.9	704	11.8	Ferritslev VI.
5	81.4	646	12.6	Sludstrup, Hinderupgaard VI.
6	82.4	638	12.9	Sludstrup, Hulby VI.
7	82.4	684	12.0	Rosted, Roskilde VI.
8	83.0	651	12.9	
9	81.2	664	12.2	
16	79.5	709	11.2	Garton's Red Intermediate.
21	74.9	683	11.0	Garton's The Lion.
22	72.4	673	10.8	Carters' Dreadnought.

APPENDIX IV.

Yields of Straw in England and Wales.

	1889-93.			1899-1903.			1909-13.			1923-27.		
	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.
Wheat ...	889	30.0	2,747	708	30.9	2,157	704	30.0	2,134	649	28.9	1,874
Barley ...	756	24.2	1,834	686	24.2	1,660	612	24.1	1,534	498	20.0	996
Oats ...	793	26.0	2,367	844	26.0	2,194	813	25.4	2,064	769	24.5	1,854
Pulse ...	207	(26)	538	163	(26)	424	186	(29)	540	143	(25)	337
Rye ...	14	(35)	49	16	(35)	56	14	(35)	51	16	(35)	55
Mixed Corn ...	—	—	—	—	—	—	—	—	—	49	(28)	184
Total ...	2,668		7,335	2,416		6,521	2,329		6,313	2,123		5,351

Yields of Straw in Scotland.

	1889-93.			1899-1903.			1909-13.			1923-27.		
	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.	1,000 ha.	Hkg. per ha.	1,000 tons.
Wheat ...	22.7	11.4	93.0	17.9	11.4	94.0	21.2	11.9	86.7	22.4	10.4	90.7
Barley ...	85.0	20.9	263.1	92.0	20.9	275.1	80.6	20.6	285.0	56.9	27.4	153.9
Oats ...	407.7	31.4	1,230.3	391.0	31.4	1,237.7	381.0	31.4	1,184.9	379.4	31.4	1,191.2
Pulse ...	6.6	(26)	17.2	3.3	(26)	13.8	3.5	(29)	10.2	1.1	(25)	4.0
Rye ...	3.2	(35)	11.2	2.4	(35)	8.4	2.4	(35)	8.4	2.2	(35)	7.7
Mixed Corn ...	—	—	—	—	—	—	—	—	—	0.6	(28)	2.3
Total ...	528		1,665	509		1,617	489		1,529	403		1,432

* The English strains were not cultivated during the last two years.

ON THE FREQUENCY DISTRIBUTION OF ANY NUMBER OF DEVIATES FROM THE MEAN OF A SAMPLE FROM A NORMAL POPULATION AND THE PARTIAL CORRELATIONS BETWEEN THEM.

By J. O. IRWIN, M.A., M.Sc. (Rothamsted Experimental Station).

Let x_1, x_2, \dots, x_n be a set of sample values from a normal population whose mean is m and standard deviation σ , the probability of obtaining such a sample is

$$C e^{-\frac{1}{2} \frac{S(x_r - m)^2}{\sigma^2}} dx_1 dx_2 \dots dx_n \quad \dots \quad (1)$$

$$\text{Since} \quad S(x_r - m)^2 = S(x_r - \bar{x})^2 + n(\bar{x} - m)^2$$

we may write (1)

$$C e^{-\frac{n(\bar{x} - m)^2}{2\sigma^2}} e^{-\frac{1}{2} \frac{S(x_r - \bar{x})^2}{\sigma^2}} dx_1 dx_2 \dots dx_n \quad \dots \quad (2)$$

Let us now transform (2) by writing

$$\begin{aligned} x_1 &= \bar{x} + X_1 \\ x_2 &= \bar{x} + X_2 \\ &\dots \dots \dots \\ x_{n-1} &= \bar{x} + X_{n-1} \\ x_n &= x + X_n = \bar{x} - X_1 - X_2 \dots \dots - X_{n-1} \end{aligned} \quad \dots \dots \dots (3)$$

The expression (2) becomes

$$C' e^{-\frac{n(\bar{x} - m)^2}{2\sigma^2}} d\bar{x} e^{-\frac{1}{2} \left\{ \sum_{r=1}^{n-1} \frac{X_r^2}{\sigma^2} + \frac{(X_1 - X_2 + \dots + X_{n-1})^2}{\sigma^2} \right\}} dX_1 dX_2 \dots dX_{n-1} \quad \dots \quad (4)$$

Now X_1, X_2, \dots, X_{n-1} are independent and are the deviations of $(n-1)$ of the sample observations from the sample mean.

From (4) it follows that their joint distribution is

$$C'' e^{-\frac{1}{2\sigma^2} (X_1^2 + X_2^2 + \dots + X_{n-1}^2 - \sum_{r,s=1}^{n-1} X_r X_s)} dX_1 dX_2 \dots dX_{n-1}.$$

By writing this

$$C'' e^{-\frac{1}{2\sigma^2} \{ (X_{n-1} - 1)(X_1 - \dots + X_{n-2})^2 + \sum_{r,s=1}^{n-2} X_r X_s - \frac{1}{2} (X_1 + \dots + X_{n-2})^2 \}} dX_1 dX_2 \dots dX_{n-1}$$

and by integrating out for X_{n-1} we find for the simultaneous distribution of X_1, X_2, \dots, X_{n-2}

$$\text{const. } e^{-\frac{1}{\sigma^2}\{a_1(X_1^2 + \dots + X_{n-2}^2) + b_1 \sum_{r=1}^{n-2} X_r X_{r+1}\}} dX_1 \dots dX_{n-2} \quad (5)$$

The process may easily be generalized so as to obtain the joint distribution of X_1, X_2, \dots, X_{n-r}

For if we consider the distribution

$$\text{const. } e^{-\frac{1}{\sigma^2}\{a_1(X_1^2 + X_2^2 + \dots + X_{n-1}^2) + b_1 \sum_{r=1}^{n-1} X_r X_{r+1}\}} dX_1 \dots dX_{n-1}$$

the elimination of X_{n-1} gives for the distribution of the remainder

$$\text{const. } e^{-\frac{1}{\sigma^2}\{a_2(X_1^2 + \dots + X_{n-2}^2) + b_2 \sum_{r=1}^{n-2} X_r X_{r+1}\}} dX_1 \dots dX_{n-2}$$

$$\text{where} \quad a_2 = a_1 - \frac{b_1^2}{4a_1} \quad b_2 = b_1 - \frac{b_1^2}{2a_1}$$

whence in general

$$a_r = a_{r-1} - \frac{b_{r-1}^2}{4a_{r-1}} \quad b_r = b_{r-1} - \frac{b_{r-1}^2}{2a_{r-1}}$$

$$\text{or} \quad a_r - \frac{1}{2}b_r = a_{r-1} - \frac{1}{2}b_{r-1} = \dots = a_1 - \frac{1}{2}b_1.$$

$$\text{Now in this case} \quad a_1 = b_1 = 1.$$

$$\text{Thus} \quad a_r = \frac{1}{2}(b_r + 1)$$

$$b_r = b_{r-1} - \frac{b_{r-1}^2}{b_{r-1} + 1} = \frac{b_{r-1}}{b_{r-1} + 1}.$$

$$\text{Thus} \quad \frac{1}{b_r} = 1 + \frac{1}{b_{r-1}} = r - 1 + \frac{1}{b_1} = r$$

$$\text{or} \quad \left. \begin{aligned} b_r &= \frac{1}{r} \\ a_r &= \frac{r+1}{2r} \end{aligned} \right\} \dots \dots \dots (6)$$

So the elimination of $X_{n-r-1}, \dots, X_{n-1}$ leaves for the joint distribution of X_1, X_2, \dots, X_{n-r}

$$K e^{-\frac{1}{\sigma^2}\left\{\frac{r+1}{2r}(X_1^2 + \dots + X_{n-r}^2) + \frac{1}{r} \sum_{u,v=1}^{n-r} X_u X_v\right\}} dX_1 \dots dX_{n-r} \quad (7)$$

This is the joint distribution of any $(n-r)$ deviates from the mean of the sample.

As particular cases we have for the joint distribution of X_1 and X_2

$$\text{const. } e^{-\frac{1}{\sigma^2}\left\{\frac{n-1}{2(n-2)}(X_1^2 + X_2^2) + \frac{1}{n-2}X_1 X_2\right\}} dX_1 dX_2 \quad (8)$$

and for the distribution of X_1

$$\text{const. } e^{-\frac{nX_1^2}{2(n-1)\sigma^2}} dX_1 \quad (9)$$

(9) is a classical result and (8) has been given by R. A. Fisher,* and the well-known results

$$\left. \begin{aligned} \sigma_{X_u} &= \sigma_{X_1} = \frac{(n-1)\sigma^2}{n} \\ r_{X_u X_v} &= r_{X_1 X_2} = -\frac{1}{n-1} \end{aligned} \right\} \dots \dots (10)$$

are at once deduced.

From (7) we may deduce the partial correlation between any two deviates when $n-r-2$ of the remaining $n-2$ are kept constant.

For the general normal surface for $n-r$ variables X_1, X_2, \dots, X_{n-r} referred to their means as origin is given by

$$Z = Z_0 e^{-\frac{1}{2\Delta} \left\{ \sum_{i=1}^{n-r} \frac{\Delta_{ii} X_i^2}{\sigma_i^2} + 2 \sum_{u,v=1}^{n-r} \frac{\Delta_{uv} X_u X_v}{\sigma_u \sigma_v} \right\}} \dots \dots (11)$$

where
$$Z_0 = \frac{1}{(\sqrt{2\pi})^{n-r} \sigma_1 \sigma_2 \dots \sigma_{n-r} \sqrt{\Delta}}$$

$$\Delta = \begin{vmatrix} 1 & r_{12} & \dots & r_{1,n-r} \\ r_{21} & 1 & \dots & r_{2,n-r} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n-r,1} & r_{n-r,2} & \dots & 1 \end{vmatrix},$$

r_{uv} is the correlation between X_u and X_v and Δ_{uv} is the prepared minor of r_{uv} in Δ .

By comparison with (7) we have

$$\left. \begin{aligned} \frac{\Delta_{rr}}{2\Delta\sigma_r^2} &= \frac{r+1}{2r\sigma^2} \\ \frac{\Delta_{uu}}{\Delta\sigma_u\sigma_v} &= \frac{1}{r\sigma^2} \end{aligned} \right\}$$

or

$$\left. \begin{aligned} \frac{\Delta_{rr}}{\Delta} &= \frac{(r+1)(n-1)}{nr} \\ \frac{\Delta_{ur}}{\Delta} &= \frac{n-1}{nr} \end{aligned} \right\} \dots \dots (12)$$

But the partial correlation between X_u and X_r , the remaining $n-r-2$ deviates being constant, is given by

$$\rho_{ur.12\dots(n-r)} = -\frac{\Delta_{ur}}{\sqrt{\Delta_{uu}\Delta_{rr}}}.$$

Hence
$$\rho_{ur.12\dots(n-r)} = -\frac{1}{(r+1)}.$$

* R. A. Fisher, *Monthly Notices of the Royal Astronomical Society*, Vol. LXXX, No. 8, p. 761.

If we take $r = 0$ we obtain

$$\rho_{11 \dots 12} \quad (\rho) = -1$$

or the correlation between two deviates when *all* the remaining deviates are kept constant is negative and perfect, as is otherwise evident.

The discussion may be completed by determining the constant K in (7).

We have

$$K = \frac{1}{(\sqrt{2\pi})^{n-r} \sigma_1 \sigma_2 \dots \sigma_{n-r} \sqrt{\Delta}}$$

where

$$\sigma_1 = \sigma_2 = \dots = \sigma_{n-r} = \sqrt{\frac{n-1}{n}} \sigma$$

and Δ is the $n - r$ th order determinant

$$\begin{vmatrix} 1 & -\frac{1}{n-1} & -\frac{1}{n-1} & \dots & -\frac{1}{n-1} \\ -\frac{1}{n-1} & 1 & -\frac{1}{n-1} & \dots & -\frac{1}{n-1} \\ \dots & \dots & \dots & \dots & \dots \\ -\frac{1}{n-1} & -\frac{1}{n-1} & -\frac{1}{n-1} & \dots & 1 \end{vmatrix}$$

Now it is easily shown that the n th order determinant

$$\begin{vmatrix} 1 & c & c & c & \dots & c \\ c & 1 & c & c & \dots & c \\ c & c & 1 & c & \dots & c \\ \cdot & \cdot & \cdot & \cdot & \dots & \cdot \\ c & c & c & c & \dots & 1 \end{vmatrix} = (1-c)^{n-1} (1 + \overline{n-1}c).$$

$$\begin{aligned} \text{Hence} \quad \Delta &= \left(1 + \frac{1}{n-1}\right)^{n-r-1} \left(1 - \frac{n-r-1}{n-1}\right) \\ &= \left(\frac{n}{n-1}\right)^{n-r-1} \left(\frac{r}{n-1}\right) \end{aligned}$$

$$\text{and } \sigma_1 \sigma_2 \dots \sigma_{n-r} \sqrt{\Delta} = \sqrt{\frac{n-1}{n}} \sqrt{\frac{r}{n-1}} \sigma^{n-r} = \sqrt{\frac{r}{n}} \sigma^{n-r}$$

$$\text{and } K = \frac{1}{(\sqrt{2\pi})^{n-r} \sqrt{\frac{r}{n}} \sigma^{n-r}}$$

Summary.

(1) The joint frequency distribution of any $(n - r)$ deviates from the mean of a sample from a normal population is given by

$$df = \frac{1}{(\sqrt{2\pi}\sigma)^{n-r}} \sqrt{\frac{n}{r}} e^{-\frac{1}{2\sigma^2} \left\{ \frac{r-1}{2r} (\bar{X}_1^2 + \dots + \bar{X}_{n-r}^2) + \frac{1}{r} \sum_{u,v=1}^{n-r} \bar{X}_u \bar{X}_v \right\}} d\bar{X}_1 \dots d\bar{X}_{n-r}.$$

(2) The partial correlation coefficient between any two of these $(n - r)$ deviates, the remaining $(n - r - 2)$ being kept constant,

$$\text{is } -\frac{1}{(r+1)}.$$



DOUBLE TAXATION AND TAX EVASION.

By W. H. COATES, LL.B., B.Sc. (Econ.), Ph.D.

- (1) Report presented by the Committee of Technical Experts on Double Taxation and Tax Evasion, Geneva 1927. C. 216 M. 85 1927 II.
- (2) Report presented by the General Meeting of Government Experts on Double Taxation and Tax Evasion, Geneva 1928. C. 562 M. 178 1928 II.
- (3) Double Taxation and International Fiscal Co-operation, by Professor E. R. A. Seligman, New York. The Macmillan Co. 1928.

MORE than four years have elapsed since the problem of Double Taxation was last discussed in these pages. In Part III of the *Journal* for 1925 there was reviewed the First Report of the Committee of Technical Officials of a number of European countries appointed by the Financial Committee of the League of Nations to study the question of Double Taxation and Tax Evasion. Since that time there have been two further Conferences of the Technical Experts. The first of these Conferences held three Sessions extending from the 17th May, 1926, to the 12th April, 1927.

The purpose of this Conference of the Government Experts, which included representatives of a larger number of countries than had hitherto taken part in the discussions, including representatives of the United States of America, was to prepare preliminary Draft Conventions between the Governments based on the Resolutions recommended by the First Meeting of the Technical Experts in 1925.

Four Conventions were prepared, viz. :—

- (a) Draft Convention for the Prevention of Double Taxation;
- (b) Draft Convention for the Prevention of Double Taxation in the special matter of Succession Duties;
- (c) Draft Convention on Administrative Assistance in Matters of Taxation;

(d) Draft Convention on Judicial Assistance in the Collection of Taxes.

In presenting these Conventions to the Financial Committee the Chairman of the Technical Experts expressed the Committee's recognition of the fact that its work was imperfect in that it did not provide solutions for all the difficulties arising in this very complex question, and he referred to the diversity of the legislative systems represented and to the necessity of finding formulæ capable of acceptance by everyone. In these circumstances, he said, the Experts were bound to confine themselves to indicating general rules. These rules, in the most important of the four Conventions, namely, that for the prevention of Double Taxation, have followed very closely the report and resolutions of the first Technical Committee, which was fully reviewed in these pages in May 1925. On that occasion strong criticism was expressed of the Committee's classification of Income Tax into Impersonal Income Tax and Personal Income Tax, or in their words "between the *Impôts réels* and *impôts personnels*." Notwithstanding the fact that steps were taken to bring these criticisms to the notice of the new Committee of Technical Experts, the Draft Bilateral Convention for the Prevention of Double Taxation still adheres to this unsound division of Income Tax into an Impersonal Tax and a Personal Tax. It may be that the Committee were conscious of their failure in this respect, because in their commentary they said that "Desirous of avoiding any controversy on matters of doctrine, the Experts have not defined the two great categories of direct taxes." They proceeded to explain that in their view Impersonal Taxes were in most cases levied on all kinds of income at the source (giving no meaning, however, to these words "at the Source"), irrespective of the personal circumstances of the tax-payer, nationality, domicile, civil status, family responsibilities, etc. In this way they distinguish Personal Taxes, which rather concern, so they said, individuals and their aggregate income. It is difficult to find any true lines of separation in these characteristics, since Impersonal Taxes often recognise family responsibilities. Nationality, domicile and civil status are not really criterions for the purpose of an Impersonal Tax per se. Individuals are concerned not only with Personal Taxes, but also with Impersonal Taxes. The only real distinction lies in the fact that Impersonal Taxes deal with separate categories of income, and Personal Taxes with an aggregate income. On this slender base rests the differentiation of treatment in the Convention of Impersonal Taxes and Personal Taxes. The case against the distinction was fully presented in the review of May 1925 and need not be repeated here. All the defects

inherent in the resolutions of the First Committee of Technical Experts are repeated in this Draft Convention. It is therefore doubtful whether the drafting of this Convention really represented any real progress towards the solution of the problem.

In June 1927 the Council of the League of Nations requested its Secretary to communicate to the Governments of all State members and the non-Government members of the League the report of the 1927 Committee of Technical Experts and also requested him to convene a General Meeting of Government Experts in 1928 for the purpose of discussing their report. This further Conference of Government Experts met in October 1928 and included representatives of 27 countries (including practically all the European nations together with China, Japan, South Africa and the United States of America as well as the Union of Socialist Soviet Republics). The model draft Conventions prepared by the 1927 Committee were adopted as a useful basis of discussion for the preparation of model texts, but it was found desirable to split the draft Convention in regard to Double Taxation by formulating in its place three model Conventions. The reason for this action lay in the extreme diversity of existing fiscal systems, which the Committee found made it impossible at the present time to recommend a convention which could be universally accepted unless the text were worded in such general terms as to be devoid of any practical value. The Committee recognised, however, that even this further subdivision would not meet the diversity of the fiscal systems, the differences in national economic interests and the divergent conceptions concerning both theory and practice. They trusted, however, to individual bilateral treaties solving the many points left open.

The first Draft Convention No. 1 A follows very closely the original Draft Convention of 1927 in providing for separate treatment of Impersonal and Personal Income Taxes. For Impersonal Taxes, immovable property, including income from mortgages thereon, is to be taxable in the State of origin. Income from shares or similar interests is to be taxed in the same way. Still no recognition is given to the fact that income from immovable property, or income from real property, as it is described in England, may be easily converted into income from personal property when immovable property is owned by an industrial corporate undertaking, with a global income flowing from its industrial occupation or use. There is no natural division of that income into income from the property and income from the industrial operations. Income from Public Funds and Bonds is also to be charged to the Impersonal Tax in the country of origin. All industrial, commercial or agricultural income is treated similarly, subject to the one exception of

income from shipping and air navigation in respect of which the right to Impersonal Income Tax is transferred to the country of residence, *i.e.* the State in which the real seat of management is situated. Salaries and wages are to be taxed in the State in which the employment is carried on, *i.e.* normally in the State of residence. The salaries of public officials serving in a foreign country are to be taxed in the State of origin. No reason at all is offered for this distinction. It rests upon the pure power of compulsion of the paying State and is an offence both to equity and common sense. Public or private pensions are both to be taxed in the State of origin. Here again a distinction is drawn between a salary and a pension, although economically a pension in respect of past employment differs in no wise, in regard to the theoretical claim of the right to tax, from a salary paid while employment is being actively exercised. Annuities are to be taxed in the State of residence. It will be seen therefore that the right to the Impersonal Tax jumps about from origin to residence in the same manner as heretofore with little regard for principles.

In the commentary on these provisions in respect of Impersonal Taxes, an exception to the standard rule of the taxation of income from public funds and bonds in the State of origin is contemplated, and it is left to the contracting States to decide whether a paragraph be added providing that, if any income is paid in one contracting State to persons domiciled in another, the tax applicable thereon shall be refunded by the State of origin. In such case that income may be taxed in the State of domicile of the creditor.

A Personal Tax on total income is to be levied by the State in which the taxpayer has his normal residence. That State, however, is to allow from its personal tax relief, in respect of the tax actually paid in the country of origin, on income from immovable property, or from industrial and commercial undertakings, or, alternatively, if it be smaller, the amount of tax on that income at the rates in force in the country of domicile.

The draft Convention 1b differs essentially from draft Convention 1a, in that it assigns income from transferable securities by priority to the State of domicile and does not maintain the distinction previously adopted between Impersonal and Personal Taxes, or between *Schedular* and *General Taxes*. In principle, the State of domicile is to levy its tax on all kinds of income. This provision registers considerable progress towards the recognition of the soundness of taxation solely on the basis of residence.

Article 2 of this Convention, however, still gives priority in the right of taxation to the country of origin in respect of income from immovable property and industrial or commercial activities. As it

is these two great sources of income which really matter, the recognition in this Convention of the principle of residence savours more of lip service than anything else.

Draft Convention No. 1c, like 1b, does not distinguish between impersonal or personal taxes, and similarly retains the main provisions of Convention No. 1a. The main difference relates to taxation of income from movable capital. In principle, tax on this income is to be levied by the State of domicile, but if the State of origin also levies a tax at the source on that income, the State of domicile is under obligation either not to levy a special tax on the same income or to deduct from such tax the amount paid in the other State. In this way the acceptance of the principle of domicile is again whittled away.

For the moment the matter remains at this point. Nations are left to conclude bilateral agreements between themselves and to use as best they may these three draft Conventions as a basis of their particular treaties. A considered opinion of the whole matter was recently expressed by the International Chamber of Commerce at its Biennial Congress in Amsterdam in July last. The resolution of the Congress read as follows :—

“An essential element in world economic reconstruction is the removal of all dispensable barriers to the flow of capital and goods between countries. Revenue systems devised with an eye directed only to internal economic processes, without recognition of the influence of taxation upon international movements of capital and commodities, almost invariably cause double taxation and are therefore adverse not only to the general interest of world trade, but also to the interest of the particular countries.

“Notable contributions to progress in the elimination of double taxation have been made through the determination of equitable principles by the Committees of the League of Nations and the International Chamber's own Committees on Double Taxation, particularly in the proposed drafts of model bilateral conventions agreed to at the Geneva Conference of Governmental Experts of October 1928.

“The International Chamber of Commerce considers that double taxation can be avoided either by taxation according to residence alone, or by taxation according to origin alone, but it recalls and endorses the views of the Economic Experts of the League of Nations and of the Double Taxation Committee of the International Chamber that in general the best method of eliminating double taxation is the adoption of the principle of residence.

“The International Chamber, however, recognises the present difficulty of entirely eliminating the principle of origin from methods

of solving the problem of double taxation (especially as regards the income on securities), mainly because a sudden change of that nature might endanger the stability of budgets.

"It nevertheless recommends that in concluding bilateral conventions the respective Governments concerned should make every endeavour to adhere as closely as possible to the principle of residence, in the hope that the growth of acceptance of this principle will facilitate the ultimate conclusion of a multilateral treaty.

"While adhering to the view that the ultimate solution of the problem lies in the adoption of a uniform multilateral treaty, and while giving its support to all partial results that may be obtained by means of plurilateral agreements, more especially in the instance of the convention on the treatment of foreigners, the International Chamber of Commerce endorses for the time being the method of settling the problem of double taxation as a whole by means of bilateral agreements, and in this connection commends the above-mentioned model conventions to all Governments, in the hope that every State will find in them guidance and help in the conclusion at an early date of separate bilateral agreements.

"In particular, the International Chamber of Commerce charges its National Committee in each country to keep these suggestions constantly before its Government with a view to the revision of its national laws and the prompt conclusion of agreements with as many countries as possible.

"As uniformity, however, is most desirable, a further contribution towards the solution of the problem may be found in the consolidation of the three Geneva conventions into a simple system based upon the principles which inspired them, which is set out in the annex * to this resolution. The International Chamber of Commerce is convinced that the adoption of this unified method by the principal industrial and commercial countries would constitute a really effective advance towards the final elimination of double taxation.

"The International Chamber further considers that it will be highly desirable to convoke at the earliest opportunity an international conference consisting of (a) official taxation representatives, and (b) representative business men nominated by the International Chamber of Commerce, with the object of unifying as far as possible existing systems designed to abolish double taxation and of preparing a multilateral treaty."

It is gratifying to note that the International Chamber still

* Not reproduced here. This annex represents an attempt to re-consolidate the three Conventions 1a, 1b and 1c into a uniform code of rules suitable for all nations.

adheres to its view that in general the best method of eliminating Double Taxation is the adoption of the principle of residence. The economic case for this principle is unchallengeable. It is only the exigencies of budgets and the influence of the historical adherence to the principle of origin that stand in the way of its acceptance. Progress of thought in these matters, however, is extremely slow, so that for many years, no doubt, the principle of origin will hold sway, especially in regard to income from immovable property and from commercial and industrial enterprise. The injury that this principle will do to the free movement of capital and its most productive use will be hidden, though none the less real.

To the student of this problem, so complex in its economic aspect and now becoming, if it has not already become, so intricate in its historical development, Professor Seligman's latest book on Double Taxation and International Fiscal Co-operation will be extremely helpful, and all who are interested in finance owe a further debt to him. The book presents in consecutive form and in English dress a series of lectures delivered by him in French at the Académie de Droit International in The Hague in 1927. The first four chapters outline the origin of the problem of Double Taxation, and, after setting out in very clear detail the actual difficulties of the problem, provide a valuable historical review of the earlier attempts at its solution. There follows an intricate analysis of the various kinds of taxes and an able discussion on the situs, source or origin principle versus the domicile principle in relation to the principles of benefit and of ability to pay as tests of the equity of taxation. Professor Seligman then summarises in an admirable manner the history of the activities of the League of Nations in this field, commencing with the Committee of Economic Experts, of which, of course, he was a member.

The most valuable section of the book relates to the discussion of the various kinds of taxes. Here Professor Seligman breaks new ground and gives us for the first time a full analysis of his conception of Impersonal or Schedular Income Taxes. He draws a distinction between these taxes and the *Impôts Réels*. He says that Schedular Taxes are neither fish nor fowl. He differentiates them from a General Income Tax, "in that there is no room in the former for the supreme illustration of the principle of personal obligation—that of progressive or graduated taxation." He abandons the old simple dichotomy of direct and indirect taxes and commits himself to a much more complex analysis, designed to fit the various stages of development in the science of taxation which various nations have reached. The complexity of this final classification will be realised from an inspection of his schedule, which is as follows:—

Personal		On persons as such		Poll taxes	
		On persons in relation to wealth		(General property taxes. General income taxes.	
Direct	Semi-personal or Partly personal	{	On wealth in relation to persons.	Demi-personal or Half-personal.	Situs and Source Taxes. { Special property or produce taxes. Business and occupation taxes.
				Quasi-personal or almost personal.	Origin Taxes. { "Schedule" income taxes.
Mixed		{	Sometimes on persons. Sometimes on wealth.	{	Death Duties. { Share taxes. Estate taxes.
Indirect—Impersonal		{	On wealth irrespective of persons.	{	Taxes on Commodities. Taxes on Transactions.

The only complaint which may perhaps legitimately be made of this classification is that it is so complex as to render it difficult in many cases, and impossible in some, to place any given tax in its appropriate pigeon-hole. If this criticism be valid, it is sufficient in itself to preclude this classification from finding any general acceptance.

• When we come to the application of this system to the problem of Double Taxation, we find Professor Seligman adhering to the principle of economic allegiance which was outlined in the report on Double Taxation of the Economic Experts. Under this system different classes of Income Tax are assigned on different principles. For instance, all corporeal wealth, including movables and tangible immovables (with the exception of jewellery and furniture), would be assigned to origin. All intangible wealth, except real estate mortgages, would be assigned to domicile (page 127). When therefore we have a company constituting one legal entity drawing its income from various activities and various kinds of assets, in a manner which permits of no clear-cut allocation, we are flung headlong into the problem of division in order that an income analysed upon arbitrary principles may be assigned to different taxation authorities. When the system of Income Tax has reached its most developed form, as in the case of the United Kingdom, under which the burden of the tax on such a company flows, as far as its income is distributed, to the ultimate owners, the shareholders, the dominating principle of modern direct taxation, viz., ability to pay based on progressive rates of tax, will be in ruins. In fact, Professor Seligman would provide a different solution for the problem of Double Taxation for every stage of development of the science of taxation. In changing conditions of development there will have, therefore, to be changing solutions, and it would appear hopeless to expect any rational settlement of the problem of Double Taxation between two

countries whose systems of taxation are at different stages of development. In this way there can only lie confusion. Professor Seligman indeed ignores the ultimate final aim of economic action, namely, the larger production of wealth under equitable conditions for the purpose of the greater benefit of the human race. He ignores the benefits which capital always brings in its wake. He forgets that every obstacle placed in the way of capital seeking its freest, fullest and most productive use involves a diminution of the total wealth production. He has indeed lost sight of the wood of greater productivity in concentrating his gaze on the trees of taxation. The principle of freedom of movement of capital is of fundamental importance. That principle requires freedom from taxation in the borrowing country in order that the movement of borrowed money to such countries shall not be impeded. Every obstacle in the way of free circulation of capital ultimately lays its real burden upon the country which creates or maintains that obstacle. Professor Seligman sets the criticisms of the work of the Economic Experts of the German writer Dr. Schanz, against those of the present writer. Dr. Schanz objected that the principle of domicile was suitable only for creditor countries. On the short view this is true, but Dr. Schanz did not look to the long-distance benefits which are conferred upon world productivity by the investment of capital by creditor countries, and he forgot that the greater part of such benefits always rests in the borrowing country. The present writer's view is founded solely upon that long-distance object, and it is idle to say that the two criticisms dispose of each other.

Before concluding, the present writer would like to rebut Professor Seligman's accusation that, "like almost all British writers, he fails to recognise that local rates differ in essential respects from the income tax." He has paid them too long not to appreciate their true financial and economic classification. For the rest, despite the criticisms from which we have felt unable to refrain, everyone who is interested in this most troublesome problem of Double Taxation should keep this book upon their shelves as a valuable contribution to its consideration, and as a further monument of Professor Seligman's ability and industry, which have laid every student of finance and economics under such deep obligations to him.

REPORT OF THE COUNCIL

For the FINANCIAL YEAR ended December 31, 1928, and for the SESSIONAL YEAR ending June 18, 1929, presented at the NINETY-FIFTH ANNUAL GENERAL MEETING of the ROYAL STATISTICAL SOCIETY, held in the Hall of the Royal Society of Arts, John Street, Adelphi, W.C. 2, on June 18, 1929.

THE Council have the honour to submit their Ninety-fifth Annual Report.

The roll of Fellows on December 31 last, as compared with the average of the previous ten years, was as follows :—

Particulars.	1928.	Average of the Previous Ten Years.
Number of Fellows on December 31	1,079	951
Life Fellows included in the above	201	187
Number lost by death, withdrawal, or default	51	48
New Fellows elected	56	79

Since January 1 last, 37 new Fellows have been elected or restored to the list, and the Society has lost 48 by death, resignation, or default, so that the number on the list, excluding Honorary Fellows, on June 18, 1929, is 1,068, compared with 1,066 on June 19 last year.

Since June, 1928, the Society has lost by death the under-mentioned Fellows :—

	Date of Election.
*Braye, The Rt. Hon. Lord	1864
Brown, Rev. J. Redgate	1920
Field, Prof. James Alfred	1924
*Hambleton, The Rt. Hon. Viscount	1894
<i>d</i> Haynes, Thomas H.	1895
<i>d p</i> Hyde, Hon. John	1893
Justican, Edwin	1889
Kennedy, Col. J. Murray	1878
*Marten, J. T., C.S.I.	1919
Mudaliar, Vellore A., B.A., B.Com.	1925

d Donor to the Library.

p Contributor to Proceedings of the Society.

* Life Fellow.

						Date of Election.
c d p	Neison, Francis G. P., F.I.A.	...	...	...	...	1869
	Potter, Henry	...	...	...	...	1891
c d p	†Rew, Sir R. Henry, K.C.B.	...	...	...	...	1888
c	*Rosebery, The Rt. Hon. the Earl of, K.G., K.T.	...	...	...	...	1873
d	Rossiter, William S.	...	...	...	...	1923
	Shakel, Thomas W.	...	...	...	...	1914
	Southwark, The Rt. Hon. Lord	...	...	...	...	1881
	Sowray, J. Russell	...	...	...	...	1855
	Theobald, John W.	...	...	...	...	1888
	*Thompson, Henry Yates	...	...	...	...	1864
c d p	*Thompson, Sir William J., M.D.	...	...	...	...	1912
	Young, Prof. Allyn A.	...	...	...	...	1911

Honorary Fellows.

Knibbs, Sir George Handley, C.M.G.	...	...	...	1918
Sauerbeck, Augustus	...	...	...	1920
Vargha, Julius	...	...	...	1904

The long list includes the names of some very eminent Fellows and some of very long standing. The loss of Sir Henry Rew, President of the Society from 1920 to 1922, is especially lamented by his colleagues of the Council, on which he had served continuously for twenty-two years, thirteen as Honorary Secretary, five as Honorary Foreign Secretary, devoting himself whole-heartedly and zealously to furthering the work of the Society. An obituary notice of Sir Henry appeared on p. 297 of the *Journal* for this year.

The Society has also lost its oldest Fellow, Mr. J. Russell Sowray, after a record period of a little over seventy-three years' association. Mr. F. G. P. Neison and Lord Rosebery, both of whom had served on the Council, were Fellows of sixty and fifty-six years' standing, respectively, while Lord Braye and Mr. Yates Thompson were both elected in 1864. Seven more of those on the list joined the Society over thirty years ago.

It remains to mention Professor Allyn Young, whose death so soon after he had taken up his appointment in this country was greatly regretted by the Council; and to deplore the loss of three distinguished Honorary Fellows, Dr. Julius Vargha, for many years Director of the Hungarian Bureau of Statistics, Sir George Knibbs, formerly statistician to the Commonwealth of Australia, and Mr. Augustus Sauerbeck, who joined the Society in 1886 and in the same year read his first paper before them, thus initiating the series of annual articles in the *Journal* which have continued down to the present day and are familiar to all readers. A brief account of his

c Served on Council.

d Donor to the Library.

p Contributor to Proceedings of the Society.

* Life Fellow.

† Guy Medallist.

work in statistics, and also notes on the activities of Sir George Knibbs and Professor Allyn Young, appeared in the second part of the *Journal* for this year.

Since June 1928, the following new Fellows have been elected :—

Archer, Benjamin.	Kora, Porat'al D.
Armour, Alistair McBride, B.Com.	Lindsay, Harry Alexander, C.I.E.
Bailes, Hugh Haslund, A.C.A.	McKinlay, Peter Laird, M.D., D.Ph.
Beattie, Sidney Ernest Reay.	Macmillan, Angus Leith, M.A., LL.B.
Borden, Howard Granville.	Matthews, Richard.
Bresciani-Turroni, Prof. C.	Miller, James Innes.
Burbidge, Paul Bertram.	Mitchell, George A.
Chatterjee, Sir Atul Chandra.	Morrison, Hubert Peter, M.C.
Clough, William Harold.	Nelson, John Angus, B.Sc. (Econ.).
Coates, A. C.	Perkins, Leonard Charles.
Craine, William Robert.	Pollok, David.
Cramp, Charles Courtney.	Prouty, Nelson Hindley.
Cressey, Sydney, A.I.M.T.A.	Rasminsky, Louis.
Denman, Thomas.	Rider, Paul R.
Draycott, Hubert Mansfield.	Rokeling, G. D.
Ebbisham, Rt. Hon. Lord, G.B.E.	Ruler, Frank Alexander, B.Com.
Exley, Harold James.	Storey, Leslie, A.I.S.A.
Forster, Ronald Charles.	Sutch, W. B.
Fowler, Fred Denis.	Sydenstricker, Edgar.
Gardiner, Francis Charles, F.S.A.A.	Tocher, James Fowler, D.Sc.
Greenhalgh, Thomas.	Warwick, Harold Reginald.
Hawthorne, George Stanley.	White, G. Ronald, B.A.
Hill, Albert.	Williams, Herbert G., M.Sc., A.M.I.C.E.
Hodson, Henry Vincent.	Wishart, John, M.A., D.Sc.
Holloway, John Edward, B.A., D.Sc.	Zaiman, Barnet Abraham, I.C.S.
King, Kuo Pao.	

Representatives of Corporate Bodies :—

Atkinson, Major Charles Francis	<i>representing</i> The British Broadcasting Corporation.
Coldclough, J. R., B.Sc.	<i>representing</i> The Roads Improvement Association.
Haylett, Horace Alec	<i>representing</i> Messrs. Saward, Baker and Company, Ltd.
Lester, Arthur Reginald	<i>representing</i> The New Zealand Refrigerating Company, Ltd.
Lutt, H. E. W., F.I.A.	<i>representing</i> The Northern Assurance Company.
Stoessiger, Brenda North	<i>representing</i> The Gramophone Company, Limited.

During the Session 1928–29, 57 new Fellows were elected (one in place of a corporate representative who resigned), and the total number of Ordinary Fellows is now 1,068.

At the meeting on May 28 two new Honorary Fellows were elected:—

M. CLÉMENT LÉON COLSON, Professor of Political Economy and Vice-President of the Conseil d'État of France.

DR. ERNST FRIEDRICH WAGEMANN, President of the German Statistical Office and Director of the Institut für Konjunkturforschung, Berlin.

The financial position of the Society is shown in the customary statements given as appendices. It is satisfactory to be able to report that, for the first time since 1919, the income for the year substantially exceeded the expenditure, although the latter figure included the special item of £137 for printing the monograph by Professor Bowley on "Edgeworth's Statistical Writings." The improvement is partly due to the cessation of a pension paid for many years to a former employee, and partly to the economies effected in the printing of the *Journal* by the change in the arrangements made at the end of 1927, which has so far been justified by the results. The number of subscribers to the *Journal* continues to increase steadily, many new orders coming each year from foreign countries. The Fellowship also continues to increase, but not as rapidly as the Council would like. They would remind Fellows once more that the lease of the Society's present house will expire in less than two years, and that a difficult financial problem may be raised by the necessity of finding new premises in a convenient position and with sufficient accommodation for the Library.

The Ordinary Meetings have been held in each month of the Session, and the papers read before the Society were as follows:—

1928.

- I.—November 20 ... FLUX, A. W., C.B. The National Income (Presidential Address).
- II.—December 18 ... SORER, H. E. Interpretation of Periodicity in Disease-Prevalence.

1929.

- III.—January 15 ... A Discussion on the National Income, opened by PROF. A. L. BOWLEY, F.B.A.
- IV.—February 19 ... HILL, A. BRADFORD, Ph.D. Sickness in Industrial Occupations.
- V.—March 19 ... SNOW, E. C., D.Sc. Limits of Industrial Employment.
- VI.—April 16 ... BRESCIANI-TURRONI, PROF. C. The Movement of Wages in Germany, 1920–1928.
- VII.—May 28 ... LOVEDAY, ALEXANDER. Measurement of Tariff Levels.
- VIII.—June 18 ... SMITH, SIR HUBERT LLEWELLYN, G.C.B., B.Sc. The New London Survey.

The Council has recently made a new rule concerning the procedure at meetings. Papers are no longer to be read in full, but the reader is to open the discussion of his subject with a short abstract of his paper such as should not take more than twenty minutes in delivery. The object of this regulation is to ensure that there shall be sufficient opportunity for all those so desiring to take part in the discussion of the paper, copies of which are, of course, to be distributed in the usual manner.

The plan for holding supplementary study meetings referred to in last year's report resulted in the formation of a Study Group which was effectively constituted on June 25th, 1928. Meetings have been held each month from October onwards, and the following papers have been read :—

- October : "Statistics and the Public"—Inaugural Address by NORMAN CRUMP (Chairman).
- November : A discussion of the proposed Watch Committee—Opened by G. L. SCHWARTZ.
- December : "The Measurement of Stock Exchange Price Changes"—H. M. PARKINSON.
- January : "Compilation of Foreign Trade Statistics"—C. CRAFT.
 "Farm Costings and Farm Business Surveys"—R. F. GEORGE.
 "Business and the Production of Electricity"—JOSEPHINE BRYANT.
- February : "The New London Survey"—C. G. CLARK.
- March : "Statistical Data and Method in the Oil and Fat Industry"—HAROLD V. KNIGHT.
- April : "Statistical Methods in Commerce"—A. G. H. DENT.
- May : "Methods of Statistical Presentation"—DUDLEY W. WALTON.
- June : "Statistical Methods in Agricultural Research"—J. O. IRWIN.

A Watch Committee of the Group has been formed for the purpose of keeping in touch with current statistical work throughout the world, and has held four meetings. It is of interest to note that several visitors to the Study meetings were subsequently elected to Fellowship of the Royal Statistical Society.

The Frances Wood Memorial Prize offered in 1928 was awarded to Mr. Colin G. Clark, B.A., for an essay entitled "A Graphical Analysis of the Unemployment Position, 1920–1928," which was printed in the *Journal* (Part I, 1929).

The Council have decided to revive the award of the Howard Medal for an essay on some subject in social statistics, and are offering the medal for competition this year. The subject set is "The Statistics of Crime," and the latest date for sending in essays is the 31st of October.

The number of additions to the Library and the statistics of its use by Fellows and others will be found in Appendix C. The monthly average of volumes lent during the year ending May 31, 1929, was 149, and that of borrowers 58.

The Fellows named below (nominated in accordance with By-law 14) are recommended for election as President, Council and Officers of the Society for the Session 1929-30 :—

President.

A. W. FLUX, C.B.

Council.

James Bonar, LL.D.	R. G. Hawtrey.
*M. S. Birkett, O.B.E.	David Heron, D.Sc.
*Sir Basil Blackett, K.C.B., K.C.S.I.	John Hilton.
Professor A. L. Bowley, F.B.A.	Robert Holland-Martin, C.B.
A. R. Burnett-Hurst.	Leon Isserlis, D.Sc.
S. Chapman.	Professor J. H. Jones.
Clara E. Collet.	*A. W. Waterlow King.
Lewis R. Connor.	H. W. Macrosty, O.B.E.
Norman F. Crump.	Ethel M. Newbold.
W. Palin Elderton, C.B.E., F.I.A.	E. C. Snow, D.Sc.
Barnard Ellinger, C.B.E.	Sir J. C. Stamp, G.B.E., LL.D., F.B.A.
*Roger Gibb.	Harold D. Vigor.
Professor Major Greenwood, F.R.S.	*S. P. Vivian, C.B.
*Sir W. H. Hamer, M.D., F.R.C.P.	Sir A. W. Watson, K.C.B., F.I.A.
Sir E. J. Harper.	A. D. Webb.

Those marked * are proposed as new Members of Council.

Honorary Treasurer.

Robert Holland-Martin, C.B.

Honorary Secretaries.

M. Greenwood, F.R.S. H. W. Macrosty, O.B.E.
Sir J. C. Stamp, G.B.E., LL.D., F.B.A.

Honorary Foreign Secretary.

M. Greenwood, F.R.S.

The abstract of the Treasurer's account of receipts and payments and the estimate of assets and liabilities on December 31, 1928, together with the report of the Auditors on the accounts for the year 1928, are appended.

Signed on behalf of the Council,

A. W. FLUX,

President.

M. GREENWOOD,
J. C. STAMP,
H. W. MACROSTY, } *Hon. Secretaries.*

APPENDICES TO

A—(i) ABSTRACT of RECEIPTS and PAYMENTS

Year 1927.			RECEIPTS.			Year 1928.		
£	s.	d.				£	s.	d.
55	18	0	{ Dividends on			55	18	0
			{ £2,236 11s. 3d.,					
			{ Consols, Account A }					
263	3	8	{ Dividends on			263	3	8
			{ £10,527 12s. 3d.,					
			{ Consols, Account B }					
33	16	2	{ Dividends on £986 }			27	1	0
			{ Conversion Loan }					
10	18	6	{ Dividends on £886 }			22	2	2
			{ Pref. and £286 Ord. }					
12	1	9	{ Stock, L.N.E. Rly. }			12	1	3
			Interest on deposit ...					
375	18	1						
						380	6	1
1,514	2	0	Annual Subscriptions:—					
102	18	0	718 for 1928 ...		1,507	16	0	
48	6	0	65 Arrears ...		132	6	0	
			19 in Advance ...		39	18	0	
1,665	6	0						
791	10	2	Journal sales ...		748	7	7	1,680 0 0
11	5	0	Journal advertisements		13	17	6	
5	11	3	Catalogue and Index					
—			sales ...		2	6	9	
			Other sales ...		8	17	9	
808	6	5						
						773	9	7
61	1	0	Repayment of Income Tax due to Society,					
6	17	9	1926 ...			16	7	2
			Royal Economic Society and others, for					
			use of rooms ...			61	1	0
			Miscellaneous ...			12	1	
2,917	9	3						
145	13	0						
			Excess of expenditure over receipts.					

£3,063 2 3£2,911 15 11

" March 12, 1929."

ANNUAL REPORT.

for the YEAR ended DECEMBER 31, 1928.

Year 1927.			PAYMENTS.			Year 1928.		
£	s.	d.				£	s.	d.
380	0	0	Rent and Taxes :—			380	0	0
29	8	0	Rent			29	8	0
3	3	4	Hire of hall			2	15	5
			Land tax					
412	11	4				412	3	5
91	0	10	Fuel, Light and Water ...			98	2	1
13	19	3	{ Insurance, Fire and			14	6	3
18	18	0	{ Accident			63	8	0
			Repairs					
123	18	1				175	16	4
309	17	11	Salaries and Wages ...			793	4	11
91	0	0	Pension			61	0	5
63	8	2	Housekeeping expenses ...					
964	6	1				854	5	4
765	15	5	Journal :—					
198	14	6	Printing			633	1	4
22	15	6	Paper			20	6	0
51	2	6	Reporting			42	7	6
57	2	3	Literary services ...			33	6	8
			{ Re-purchase of scarce					
			parts					
1,095	10	2				729	1	6
37	9	2	Library :—					
31	19	0	Books			41	18	6
			Binding			62	0	0
119	8	2				103	18	6
21	2	3	Advertising			11	8	0
157	17	2	{ Stationery and Miscel-			181	19	4
141	14	9	{ laneous Printing			137	2	5
17	0	6	{ Postage, including			15	13	8
2	5	0	{ Journal			2	5	0
7	8	9	Telephone			4	19	3
			Guy Medal					
			Miscellaneous					
347	8	5				353	7	8
			Edgeworth monograph ...			136	12	5
			Total Expenditure ...			2,765	5	2
			Excess of receipts over ex-			146	10	9
			penditure					
<u>£3,063 2 3</u>						<u>£2,911 15 11</u>		

(Signed)

"M. S. BIRKETT, P. G. BROWN, J. CALVERT SPENSLEY, *Auditors.*"

A.—(ii) ESTIMATE of ASSETS and

LIABILITIES.					
Year 1927.			Year 1928.		
£	s.	d.	£	s.	d.
145	5	4	{ Miscellaneous Ac- counts, as per list ... }	130	5 8
48	6	0	{ Subscriptions received in advance (19) ... }	39	18 0
107	14	0	{ Journal subscriptions received in advance }	102	12 0
301	5	4			278 15 8
1,071	0	0	Life Composition Fund ...	...	1,155 0 0
					1,433 15 8
7,237	16	4	{ Balance in favour of the Society (ex- clusive of (1) Books in Library; (2) Journals in Stock; and (3) Pictures, Furniture and Fixtures) ... }	7,427	5 4
<u>£8,610 1 8</u>			<u>£8,861 1 0</u>		

A.—(iii) BUILDING FUND (ESTABLISHED *July 10, 1873*) :

This Fund was at 31 December, 1927, invested in £918 3s. 10d. Metropolitan Con- and re-invested in £575 17s. 11d. 3½ per cent Conversion Loan and £518 3s. 7d. was purchased and the total investment on 31 December, 1928, amounted to (Prices, 31 December, 1928, £79 5s. and £38 5s. respectively; value £947.)

A.—(iv) *The FRANCES WOOD MEMORIAL FUND* :

This Fund is invested in £500 4 per cent. Preference Stock, London Midland and follows:—In hand at December 31, 1927, £46 18s. 3d.; Dividends received, £22 18s. 3d. (Price, December 31, 1928, £72 10s.; value £362.)

“ *March 12, 1929.* ”

LIABILITIES on DECEMBER 31, 1928.

Year 1927.			ASSETS.		Year 1928.			
£	s.	d.			£	s.	d.	
1,241	0	0	{ £2,230 11s. 3d. Consols (General Fund). (Price, December 31, 1928, £56 5s.) say		1,258	0	0	
5,843	0	0	{ £10,527 12s. 3d. Consols (Guy Bequest). (Price, December 31, 1928, £56 5s.) say		5,922	0	0	
744	0	0	{ £966 3½ per Cent. Conversion Loan. Price, December 31, 1928, £79 5s.) say ...		765	0	0	
431	0	0	{ £666 4 per Cent. 2nd Preference Stock, L. & N.E. Rly. (Price, December 31, 1928, £50) say ...		333	0	0	
116	0	0	{ £266 5 per Cent. Preferred Ordinary Stock, L. & N.E. Rly. (Price, December 31, 1928, £24 10s.) say ...		65	0	0	
1,735	0	0				8,343	0	0
			Cash Balances:—					
111	0	11	At Bank	176	19	4		
4	15	9	Petty cash	2	8	1		
149	16	8						
			Deposit Balance			179	7	5
2	5	0	Sundry debtors			200	0	0
81	0	0	{ Arrears of Subscriptions recoverable } say 40			54	13	7
						84	0	0
£3,610	1	8				£8,861	1	0

STATEMENT of the FUND on DECEMBER 31, 1928.

solidated 3½ per cent. Stock. During the year this Stock was sold for £392 0s. 4d. 4 per cent. Consols. With the dividends received during 1928 additional stock £596 16s. 6d. 3½ per cent. Conversion Loan and £536 19s. 2d. 4 per cent. Consols

STATEMENT of the FUND on DECEMBER 31, 1928.

Scottish Railway. The position of the income of the Fund in 1928 was as £16, making a total of £62 18s. 3d. Expenditure, Prize £30. Balance in hand

(Signed)

"M. S. BIRKETT, P. G. BROWN, J. CALVERT SPENSLEY, Auditors."

A.—(v) REPORT OF THE AUDITORS FOR 1928.

The Auditors appointed to examine the Treasurer's Accounts for the Year 1928,

“REPORT :—

“That they have compared the Entries in the Books with the Vouchers for the same, from January 1 to December 31, 1928, and find them correct, showing that the net RECEIPTS, excluding Life Compositions, £84, were £2,911 15s. 11d., and the PAYMENTS were £2,765 5s. 2d., showing an excess of receipts over expenditure of £146 10s. 9d. A Life Composition Fund liability has been shown on the Balance Sheet amounting to £1,155, being the £1,071 earmarked at the end of 1927 increased by the £84 received in 1928.

“They have also had laid before them an Estimate of the Assets and Liabilities of the Society at the same date, the FORMER amounting to £8,861 1s. 0d., and the LATTER to £1,433 15s. 8d. (including the Life Composition Fund), leaving an excess of Assets over Liabilities of £7,427 5s. 4d., EXCLUSIVE of (1) Books in the Library; (2) Journals, &c., in Stock; and (3) Pictures, Furniture and Fixtures.

“They have VERIFIED the Investments of the Society's General Funds (£2,236 11s. 3d. Consols, £966 3½ per cent. Conversion Loan, £666 L. & N.E.R. 4 per cent. Second Preference Stock, and £266 L. & N.E.R. 5 per cent. Preferred Ordinary Stock); the Guy Bequest (£10,527 12s. 3d. Consols); the Building Fund (£596 16s. 6d. 3½ per cent. Conversion Loan and £536 19s. 2d. 4 per cent. Consols); the Frances Wood Memorial Fund (£500 4 per cent. L.M. & Scottish Railway Preference Stock); and also the Bankers' balance of £200 on deposit account and £176 19s. 4d. on current account; all of which were examined and found correct. The market prices at December 31, 1928, have been adopted in valuing the Society's investments.

“They further find that at the end of the year 1927 the number of FELLOWS on the list was 1,074, which number was reduced in the course of the year 1928 to the extent of 51, by Death, Resignation, or Default; and that 56 new Fellows were elected or restored to the list, leaving on the list on December 31, 1928, 1,079 Fellows of the Society, of whom 201 were compounders.

(Signed)	“M. S. BIRKETT,	} Auditors.”
	“P. G. BROWN,	
	“J. CALVERT SPENSLEY,	

“March 12, 1929.”

B.—Statement of the Condition of the Society in the last Twenty-five Years, 1904–1928.

Year.	Number of Fellows on Decem-ber 31.	Number of Late Fellows included therein.	Losses during Year by Deaths, &c.	Gain by Election, &c., during Year.	Receipts from					Payments.			Amount in-vested on December 31. ^b	Year.
					Annual Subscrip-tions.	Com-positions.	Journal Sales.	Inven-tments, ^c &c.	All Sources.	Total.	Of which			
											On Journal.	On Librarr.		
1904	923	175	58	44	1,407	124	253	152	1,936	£ 1,931 ^a	£ 621	£ 92	£ 3,400	1904
1905	911	178	59	45	1,465	168	220	220	2,073 ^c	2,074 ^c	665	92	11,975 ^d	1905
1906	891	177	63	43	1,464	82	225	408	2,274 ^e	1,988	645	95	11,449	1906
1907	861	172	63	33	1,363	82	327 ^g	408	2,180	2,401 ^f	571	87	11,746	1907
1908	855	170	46	40	1,339	84	254	494 ^h	2,171 ^h	2,428 ⁱ	602	92	11,920	1908
1909	825	167	82	52	1,307	84	273	396	2,060	2,369	641	99	12,084	1909
1910	845	172	37	57	1,304	141	326	974 ^l	2,746 ^l	2,736 ^l	803	74	11,210	1910
1911	867	174	40	62	1,415	126	308	405	2,255	2,372 ^m	721	104	10,875	1911
1912	854	175	67	44	1,336	105	334	382	2,157	2,174	776	81	10,599	1912
1913	846	174	61	53	1,331	84	294	399	2,108	2,058	671	79	10,082	1913
1914	821	169	61	39	1,281	42	271	489 ^o	2,083	2,319 ⁿ	813	88	9,528	1914
1915	772	163	64	12	1,243	63	268	351	1,925	1,803	448	40	8,182	1915
1916	758	163	48	34	1,181	42	325	302	1,850	1,655	507	36	7,702	1916
1917	757	161	41	40	1,186	52	311	305	1,854	1,732 ⁿ	403	54	7,656	1917
1918	761	167	43	47	1,132	222	305	459	2,118	1,900 ^p	665	32	8,283	1918
1919	796	172	56	123	1,297	273	603	286	2,459	2,784 ^p	782	50	7,672	1919
1920	882	180	37	98	1,373	260	730	291	2,739	2,838	951	99	6,847	1920
1921	946	180	48	112	1,480	*	661	279	2,783	2,827	887	94	7,605	1921
1922	960	187	48	71	1,499	*	688	345	3,009	3,388 ^q	951	103	8,604	1922
1923	998	195	39	66	1,476	*	738	387	2,856	2,940	853	107	8,666	1923
1924	1,002	194	62	68	1,638	*	666	389	2,785	2,970	860	137	8,902	1924
1925	1,020	195	51	79	1,611	*	806	398	2,890	2,962	872	116	8,423	1925
1926	1,054	197	53	77	1,619	*	780	395	2,915	3,110	1,066	98	8,122	1926
1927	1,074	199	42	62	1,665	*	791	376	2,917	3,063	1,095	119	8,375	1927
1928	1,079	201	51	56	1,680	*	748	380	2,912	2,765 ^r	729	104	8,343	1928

¹ Includes £130 for re-decoration of premises, installing electric light, and furniture.

^a Includes £168 for furniture and carpets and "at home" expenses.

^m Includes £100 to International Statistical Institute.

^c Includes £100 raised by sale of £134 13s. 8d. Consols for the purpose of note n.

^e Includes purchases of National War Bonds.

^f Includes £1575 was extraordinary expenditure (Catalogue and Index).

^g Includes £137 for printing Biddisorth monograph.

^h Includes £137 for printing Biddisorth monograph.

ⁱ Includes £137 for printing Biddisorth monograph.

^j Includes £137 for printing Biddisorth monograph.

^k Includes £137 for printing Biddisorth monograph.

^l Includes £137 for printing Biddisorth monograph.

^m Includes £137 for printing Biddisorth monograph.

^a Includes purchase of Government stock.

^b Includes purchase of Government stock.

^c Includes purchase of Government stock.

^d Includes purchase of Government stock.

^e Includes purchase of Government stock.

^f Includes purchase of Government stock.

^g Includes purchase of Government stock.

^h Includes purchase of Government stock.

ⁱ Includes purchase of Government stock.

^j Includes purchase of Government stock.

^k Includes purchase of Government stock.

^l Includes purchase of Government stock.

^m Includes purchase of Government stock.

U.—Estimated Numbers of Books Added to the Library and Lent, and Numbers of Borrowers from the Library in the Sessional Years 1926-27, 1927-28 and 1928-29.

Months.	Works Received.*			Books Lent.						Borrowers.			Months.	
	1926-27.	1927-28.	1928-29.	1926-27.		1927-28.		1928-29.		1926-27.	1927-28.	1928-29.		
				Works.	Vols.	Works.	Vols.	Works.	Vols.					
1928.														1928.
June ...	...	...	...	146	174	132	148	127	136	83	59	66	June
July ...	640	645	654	101	107	131	146	147	168	60	64	60	July	
August ...	...	...	...	80	84	65	87	62	72	47	33	36	August
September ...	...	...	...	122	144	104	120	72	81	66	48	40	September
October ...	...	...	...	142	155	146	182	121	161	75	79	56	October
November ...	...	...	...	147	166	222	273	162	179	69	94	73	November
December ...	...	...	...	151	174	135	164	113	130	74	55	52	December
1929.													1929.	
January ...	324	298	202	193	243	162	185	170	186	96	71	84	January	
February ...	...	...	...	117	134	128	142	116	135	73	62	52	February
March ...	212	135	156	107	231	162	179	115	244	102	73	66	March	
April ...	...	...	...	121	143	127	172	119	135	66	55	62	April
May ...	252	200	113	162	186	73	80	137	158	80	47	54	May	
12 months	1,428	1,278	1,125	1,679	194	1,587	1,878	1,461	1,785	891	740	701	12 months	
Monthly average	119	106	94	140	162	132	156	122	149	74	62	58	Monthly average	

* These figures represent the number of works entered during the year, under "Additions to the Library," in the *Journal*, and not the number of separate volumes; they are exclusive of about 200 weekly, monthly, and quarterly periodicals regularly received.

D.—(i.) *Comparison of Income, 1918–1928.*

	1918	1919.	1920	1921	1922	1923	1924	1925	1926	1927	1928
Dividends and interest (excluding those on special funds) ...	£ 274	£ 276	£ 291	£ 279	£ 345	£ 387	£ 389	£ 399	£ 395	£ 376	£ 380
Income tax refunds ...	107	108	108	109	109	33	11	—	—	—	16
Annual subscriptions ...	1,131	1,296	1,373	1,480	1,499	1,476	1,638	1,611	1,619	1,665	1,680
Journal sales ...	304	602	740	687	688	738	666	806	780	791	748
„ advertisements ...	3	3	3	17	23	17	13	14	9	11	14
Catalogue, Index, and other sales ..	—	—	—	—	9	3	3	1	11	6	11
Use of rooms, etc. (Royal Econ. Soc. and others) ...	35	35	120	60	60	60	60	30	90	61	61
Miscellaneous ...	—	—	—	1	3	2	4	—	—	7	1
Total ordinary income ...	1,855	2,320	2,653	2,633	2,737	2,716	2,784	2,861	2,904	2,917	2,911

D.—(ii) Comparison of Expenditure, 1918-28.

	1918.	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
	£	£	£	£	£	£	£	£	£	£	£
Rent, including hire of hall, and taxes	398	400	398	421	429	429	429	416	409	413	412
Fuel, light, water	54	67	82	74	85	100	93	91	65	91	98
Insurance	21	16	17	17	17	17	17	14	31	14	14
Furniture, repairs, and office equipment	16	42	43	56	18	63	33	59	65	19	64
Salaries, wages, and Nat. Insee.	491	606	663	705	736	738	751	750	757	785	768
Pension	52	52	78	91	91	91	91	91	83	91	—
Housekeeping expenses	36	34	40	40	43	42	65	54	65	63	61
Journal costs, including repurchase	591	669	841	881	904	853	850	872	1,066	1,096	729
Library (books and binding)	33	115	99	94	103	107	138	116	99	119	104
Advertising	26	34	22	17	9	21	24	23	25	21	11
Stationery and sundry printing	100	137	188	172	139	129	127	136	100	158	182
Postage and telephone	82	50	124	139	155	130	140	139	154	159	153
Miscellaneous, including medals	15	30	31	28	10	21	9	10	8	9	7
Total ordinary expenditure	1,917	2,252	2,626	2,735	2,739	2,741	2,767	2,771	2,927	3,038	2,603
<i>Special expenditure.</i>											
Catalogues and Indexes	11	180	180	180	600	180	180	180	183	25	25
Official Statistics Committee	—	51	3	—	—	—	—	—	—	—	—
Dinner to Statisticians	—	—	35	—	—	—	—	—	—	—	—
Leeds meeting expenses	—	—	—	—	—	—	—	10	—	—	—
Journal Index, 1909-24	—	—	—	—	—	—	—	—	—	—	—
Edgeworth monograph	—	—	—	—	—	—	—	—	—	—	137
Total	1,928	2,483	2,844	2,915	3,339	2,921	2,947	2,961	3,110	3,063	2,765

D.—(iii) Comparison of Total Income and Expenditure, 1918–28.

Year.	Income (including Compositions placed to Income).	Expenditure (including special).	Deficit (–) or Surplus (+).
	£	£	£
1918	2,077	1,928	+ 149
1919	2,593	2,483	+ 110
1920	2,785	2,844	– 59
1921	2,634*	2,915	– 281
1922	2,737*	3,339†	– 602
1923	2,716*	2,921	– 205
1924	2,784*	2,947	– 163
1925	2,861*	2,961	– 100
1926	2,915*	3,110	– 195
1927	2,917*	3,063	– 146
1928	2,912*	2,765	+ 147

* Compositions received in and since 1921 have been placed to capital account (in 1921, £231; in 1922, £126; in 1923, £233; in 1924, £105; in 1925, £189; in 1926, £115; in 1927, £84; in 1928, £84).

† Includes £395 spent on printing of Catalogue, £122 only coming out of income.

D.—(iv) Comparison of Investments at December 31, 1913 and 1928.

Investment.	Nominal holding.		Remarks.
	End of 1913.	End of 1928.	
	£ s. d.	£ s. d.	
Consols A.	2,371 6 0	2,236 11 3	
Consols B, Guy Bequest.	10,527 12 3	10,527 12 3	
G.N.R. Pref. Conv. Ord. Stock.	1,000 0 0	—	
L.N.E.R., 4 per cent.	—	666 0 0	
Second Pref. Stock.	—	266 0 0	
L.N.E.R., 5 per cent. Pref. Ord. Stock.	—	966 0 0	Conversion of £600 War Bonds representing savings during the war.
Conversion Loan.	—	—	
Total holding, General Fund (nominal values).	13,898 18 3	14,662 3 6	Total actual values are shown in Appendix B.

NOTE.—(a) In addition to these holdings the Society has its Building Fund, worth in 1914 £582, and in 1928 £947.

(b) At the end of 1914 the number of compounders was 169, and at the end of 1928 it was 201. At the latter date £4,074 of capital represents life compositions, as against £3,549 in 1914.

PROCEEDINGS OF THE NINETY-FIFTH ANNUAL GENERAL MEETING
OF THE ROYAL STATISTICAL SOCIETY, HELD IN THE HALL OF THE
ROYAL SOCIETY OF ARTS ON TUESDAY, JUNE 18, 1929.

The Chair was taken by the President, MR. A. W. FLUX, C.B., at 5.0 p.m.

The HONORARY SECRETARY read the circular convening the meeting.

The Report of the Council for the financial year 1928 and the Session 1928-29 was presented to the meeting and taken as read.

The CHAIRMAN, in moving the adoption of the Report, referred to the paragraph showing the year's gains and losses in the Fellowship and emphasized the importance of increasing the number of Fellows, and, drawing attention to the reduction in the figures showing the use made of the Society's library, reminded those present that Fellows had an unrivalled collection of statistical works at their disposal. He also expressed his satisfaction at the progress made by the newly-organized Study Group in the first year of their existence.

MR. C. K. HOBSON seconded the adoption of the Report, and the motion, on being put to the meeting, was carried unanimously.

The PRESIDENT read the list of persons whose names the Council had ordered to be removed from the roll of the Society in accordance with Bye-law No. 9, their annual subscriptions being three years or more in arrear.

Oscar Birley, A. M. Campbell, Y. C. Chu, William Doherty, Arthur Fitton, W. H. Higginbotham, H. C. Holmes, A. M. Kamal, H. L. Khanna, Sri Krishna, Dudley Lemon, D. G. McLean, E. Myers, O. B. Rêgo, A. E. P. Roberts, E. R. Sjostrand, H. K. Stein, L. A. Terry, F. W. Thomas, W. J. Warwick, Basil Woodd.

The ballot for the election of the Council and Officers for the ensuing session then took place, Mr. A. W. Basham and Mr. R. F. George being appointed as scrutineers.

A cordial vote of thanks to the retiring Council and Officers was moved by Mr. C. W. PEARSALL and seconded by Mr. A. P. L. GORDON, and was carried unanimously.

The CHAIRMAN announced that the Council and Officers nominated on the ballot paper had all been elected.

The meeting then adjourned for the Ordinary Meeting.

REVIEWS OF STATISTICAL AND ECONOMIC BOOKS.

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1.—*Introduction to the Mathematics of Statistics*. By R. W. Burgess, Ph.D., under the editorship of Professor J. Wesley Young viii + 304 pp. U.S.A.: Houghton Mifflin Co.; London: George G. Harrap & Co., Ltd., 1929.

In the Editor's introduction to this volume a division is made of the more serious books on statistics which have been published in the last few years in the United States. They are said to fall essentially into two classes: those written primarily by mathematicians, which are largely theoretical and make considerable demands on the mathematical preparation of their readers; and those written by specialists in other fields intended primarily for use by other specialists in those fields. The latter are usually limited as to their methods and often unsound as to their mathematics. The aim of this publication is to avoid both pitfalls—not to over-emphasize methods peculiar to, say, biometry, economics, or psychology, but to give a general outline of the best methods of statistical analysis, while demanding from the reader no advanced knowledge of mathematics. ("The book is intended for those of mathematical maturity equal to that of college students who have had one year of mathematics in college, including the theory of logarithms and elementary graphics," p. vii. What little mathematics are used are simplified for the non-mathematical by numerical illustrations.) It fulfils this function very well, dealing in clearly written style with frequency distributions and their various constants, correlation—simple and multiple—and regression, time series and index-numbers, and percentage analysis. A short section on sampling is included with a discussion of the normal curve and probable errors. Limitation of space and mathematics, however, makes it necessary for the probable errors of most statistical constants to be given without proof. Considerable attention is usefully paid to the various graphical

methods of representing statistics. There are a number of precepts spread about the book—quite elementary, but such that if they were firmly impressed on the mind of every compiler of a statistical table the general reader's lot would be a much happier one. For instance, "an investigator should not . . . include a ratio or percentage in his report unless in his opinion it actually does help the reader to understand the facts. Stating a percentage in a report, therefore, implies a judgment that it is significant, and finding a percentage is a step in the *analysis* of a statistical series" (p. 16). One would add to this that percentages should never be given *in place* of the absolute figures, as is so often done.

Or, again, "the correlation coefficient should not be relied on to give the complete and only analysis and summary of relationships in a given problem" (p. 209). The author rightly stresses amongst other points the use of the regression equations and the making of a scatter diagram.

Three tables are given as appendices: (1) decimal values of common fractions with two digit denominators—for use, amongst other things, in finding percentages; (2) values for use in calculating the coefficients of a parabolic regression formula as applied to historical series; and (3) a short table of ordinates and areas of the normal curve and of certain gamma curves.

It is to be hoped that the title on the book cover, "the mathematics of statistics," will not scare the scientific worker away from a book which is really not very mathematical but discusses various statistical constants quite clearly and simply.

A. B. H.

2.—*Migration and Business Cycles*. By H. Jerome. With a foreword by Wesley C. Mitchell. 250 pp. Published by the National Bureau of Economic Research Inc., New York. 1928. Price \$3.50c.

This book presents the results of investigations made by the National Bureau of Economic Research in the United States. It was primarily designed to answer two specific questions—(1) to what extent are fluctuations in migration attributable to fluctuations in employment? and (2) to what extent, in turn, are fluctuations in migration an ameliorating influence, and to what extent an aggravating factor, in employment and unemployment fluctuations? In answering these questions other aspects of the migration problem are touched upon, but in the main the book deals with the purely economic problem of the relationship between migration and trade.

It is highly desirable that the book should be studied by those taking part in the discussions now proceeding on the subject of developing emigration as a contribution towards the cure of the unemployment problem in this country. As long ago as 1911 the British Government of that day appointed a Royal Commission (the Dominions Royal Commission) to examine, *inter alia*, the subject of emigration; and this Commission was so impressed by the problem of the relationship between migration and trade that they caused a special enquiry to be undertaken on the effect on British

trade of emigration from the United Kingdom. As a consequence of the war the report of that Commission received little public notice at the time of its issue, and since then appears to have been almost completely forgotten.

It is of interest to compare the conclusions drawn by the investigator for the Dominions Royal Commission working upon data of the United Kingdom with the conclusions drawn by this American enquirer. The British enquiry after a thorough statistical investigation concluded that "there is little evidence that migration *directly causes* increase in external trade. The relationship between them appears to be one of association merely—the waves and depressions of trade and migration occur together—and the enquiry gives no support to the opinion that activity in migration *causes* activity in trade (except, of course, in so far as the emigrants themselves take British goods from the United Kingdom). . . . Left to itself, migration (with the exception of that from Ireland) appears to be a phase of a world-wide economic phenomenon—an indication of prosperous conditions. The periodic booms in trade throughout the world require some redistribution of labour, and this has been effected by migration. . . . Migration is an important aid to commercial and industrial welfare by effecting the translation of labour to its most productive spheres. It is not justifiable to assume from this, however, that the *artificial* transportation of a considerable population to the Colonies in a time of industrial stagnation is necessarily going to do much to accelerate the time of prosperity."

The American enquirer looked at the matter from an entirely different angle, but there is substantial concordance between the general conclusions. He concludes: "As to cyclical fluctuations in unemployment, it would appear that, directly at least, migration is probably not a primary cause of such variations in unemployment. . . . This conclusion is based in part upon the fact that the timing of migration changes to cyclical changes in employment is imperfect; and secondly upon the fact that the peaks and troughs of industrial activity frequently coincide in the countries of immigration and emigration, in which case migration cannot be well adjusted to conditions in both countries." This coincidence of the curve of migration and of the curve of industrial activity was also found in the case of the British enquiry. Before the war the curve of industrial prosperity in one country moved very similarly to that in another industrial country, and both curves agreed fairly well with the curve of migration.

A new situation has now arrived, however, in which the curve of prosperity in two industrial countries, *e.g.* the United States and the United Kingdom, do not appear to coincide, and great prosperity in one country synchronizes with relative depression in another country. The period during which these circumstances have existed is, however, too short to provide data for an adequate enquiry, and the facts seem to warrant special reserve in drawing conclusions. The author of the book states: "The demonstrated sensitiveness of immigration and emigration to employment conditions may lead to

an exaggerated estimation of the efficacy of migration as a safety-valve for an over-crowded labour market in depression periods." On the whole the conclusions of the American enquiry support those of the previous British enquiry and demonstrate the need for great caution in developing schemes of migration in the expectation that they will provide a remedy for the industrial depression in this country.

As a matter of greater interest to the statistician than to the political economist, it is noteworthy that the actual statistical method used in the American enquiry was on a similar basis to that used in the earlier British enquiry. In measuring the relationship between emigration and industrial prosperity in Great Britain the British enquiry correlated the fluctuations in emigration from the United Kingdom to (a) Australia, (b) Canada and (c) the United States with the fluctuations in the exports from the United Kingdom to the countries named, and similarly also with the fluctuations in the imports to the United Kingdom. The measure of the industrial activity used by the American investigator was that of the production of pig iron, and he determined the correlation coefficient between immigration and the production of pig iron over the period from 1872-1914. The period used by the British enquiry was 1878-1910, and the comparison of the results of the two enquiries is as follows :—

Correlation Coefficient between Migration and Industrial Activity in
(a) the same year, (b) the previous year and (c) the previous year but one.

	(a).	(b).	(c).
American immigration and pig-iron production—			
1872-1914	+ .78	+ .48	— .11
U.K. emigration to and exports to (1) Australia ...	+ .01	+ .49	+ .05
(2) Canada ...	+ .83	— .22	— .46
1878-1910 (3) United States ...	+ .72	+ .17	— .36
U.K. emigration to and imports from (1) Australia	— .16	— .18	+ .19
(2) Canada	+ .38	+ .26	— .50
1878-1910 (3) United States	+ .37	— .07	— .10

The book is a noteworthy contribution to a subject of serious importance to students of economics and politics in this country.

E. C. S.

3.—*The Variability of Prices*. Vol. II. Part A. By Dr. Lodewijk Hamburger. 88 pp. The Hague: N. V. De Amstel. 1929. Price 5s.

This volume forms the second stage in a prolonged study of prices that has engaged Dr. Hamburger for some time. The first volume, which unfortunately has not yet been translated into English, dealt with the relationship of prices within a single country.

This volume deals wholly with international price relationships, and consists of an elaborate attempt to analyse mathematically the doctrine of purchasing power parity.

It is only fair to the author to say that owing to the fact that the book is both a translation and a sequel, it is not an easy one for an Englishman to read. Statistics, like other sciences, has its own language, which is to some extent international in character, but slight differences occur from time to time both in words and also in mathematical symbols. In any case, when a man has invented his own mathematical treatment of a subject, it is essential that he should explain his method with almost excessive clarity if another is to comprehend and benefit. It is in this respect that, owing to the translation difficulty, the English reader will find himself at sea.

To come now to the subject-matter of the book. Ever since Professor Cassel enunciated his famous purchasing power parity theory, it has been common knowledge that the quoted rate of exchange between two countries has rarely agreed exactly with their purchasing power parity. It is true that a rough correspondence has existed, sufficient to make the theory a rough but invaluable guide through the labyrinth of post-war exchange fluctuations. Yet all the way through divergences have occurred, which at times have been of a serious nature.

It is the nature and origin of these divergences of the quoted exchange from the purchasing power parity that Dr. Hamburger has set himself to examine. To do this he makes a theoretical comparison between a "sound" and an "unsound" currency country, and he also makes several arbitrary assumptions so as to confine the problem "within a narrow setting." His first thesis is that there are two important stages in a country's currency decline and fall. The first is when the country's currency depreciates more at home than abroad, with the result that its prices rise above the world level, and imports are stimulated. The second stage is when the position is reversed, so that its home prices fall below the world level, resulting in a stimulus to its export trade. From this contrast between the two stages, Dr. Hamburger proceeds to discuss both sets of disparities between home and foreign prices, and to make a mathematical attempt to account for their existence and magnitude.

The main basis of his approach to the problem is what he calls the risk factor. "It is therefore justifiable," he says, "to ascribe abnormal differences in price behaviour largely to risk consequences. Especially should disparities—occurring simultaneously between the average behaviour of the well-organized markets of different nations—be considered as closely correlated with heavy risks by which a period of commotion is characterized." Now this is all very well so far as it goes, but it is open to three serious objections. First and foremost, the question of risk, and a trader's estimate of risk, is the last thing upon which it is safe to base a complex mathematical analysis, and Dr. Hamburger's subsequent work only confirms that view. Next, the risk factor is not the only factor, and it is by no means certain that it is the principal factor. Dr. Hamburger almost

entirely overlooks the vital matter of the lags and leads that a depreciating currency calls into existence between exchange rates, raw material prices, living and wage costs, selling prices of finished goods, import and export prices, and so on. He pays little attention to the effects of foreign exchange purchases and sales due to international movements of capital, currency speculation, transfer of short money, and other operations of a financial as opposed to a commercial character. Finally, he fails to realize that the only data at his disposal relate to a period which began with the biggest war known to history, and ended with the emergence of the world from a time of economic chaos, during which gold itself showed itself capable of almost as many vagaries as some of the less depreciated paper currencies. In short, unless the reviewer has been led gravely astray by the translation difficulty, Dr. Hamburger's analysis bears as much relation to actual facts as does a Territorial field-day to active service. It is a drill, and an interesting drill, but that is all.

N. E. C.

4.—*Taxation in the Modern State.* By Alzada Comstock. 236 pp. London: Longmans. 10s. 6d. net.

This book gives a short descriptive account of leading features of the financial position of the principal countries of Europe and of the United States. The ratio of debt charges to total revenue is shown for the various countries, in some cases giving comparisons with pre-war figures. Stress is laid on the comparative unimportance of external debt—the British payments to the United States being, for instance, only about 5 per cent. of the total revenue. It might have been pointed out, however, that the difficulties involved in an external payment are greater than those involved in a like amount of internal payment. For Germany the reparations payments under the Dawes plan for 1927–8 are given as 21·8 per cent. of the budget expenditure, but the total debt charge, including reparations, is only 27 per cent. of the budget expenditure, a smaller proportion than in the case of most of the Allied countries—owing, of course, to the fact that Germany's internal debt was nearly wiped out by the depreciation of the mark.

The greater part of the book is occupied with illustrations of the more striking changes in the methods of raising revenue which have developed during and since the war.

Direct taxation, that is to say, mainly income tax, has made great headway in the United States, Great Britain, Germany, Italy, and France. The Report of the League of Nations Committee on National Debt and Taxation, 1927, and of the British Committee on National Debt, 1927, are the principal authorities quoted, but there is also a brief discussion of the principle of preferring direct to indirect taxation, with brief quotations of the views of leading economists.

The feature of most interest, perhaps, to English readers is the account given of sales taxes, which have become such important means of raising revenue in Austria, Belgium, France, Germany, and

other countries of Europe, and in Canada. It is said that the British and American view that such taxes would work unfairly by favouring large businesses with branches, in competition with independent smaller businesses, has not been found to apply in practice—or at least these taxes seem not to have had any noticeable effect in forcing vertical amalgamations, notwithstanding that it was found impracticable to make large combinations with branches pay tax on the transfer of goods to branches. "As year after year passes over them, the evidence accumulates that something weightier than a 1 per cent. or 2 per cent. difference in costs is necessary to eliminate any one type of business" (p. 117). The administrative difficulties are also said to have been overcome, with experience: "The later history of the French turnover tax seems to bear out the old saying that any old tax is a good tax. With the passing years much of the opposition and many of the difficulties of collection have disappeared" (p. 134).

The accounts of these tax methods, in a part only of a small book, are necessarily very brief, however, and one does not find very much light on the question of how they are really made to work. Admittedly they are taxes on the general body of people, with practically no graduation, and it may be expected that in course of time income taxes will tend to take their place. They met a great practical difficulty in the times of depreciating currency and are perhaps less difficult to assess than income taxes.

In countries having a large population of peasant farmers, this method of taxation, together with customs and excise, is the practical means of making the peasant class contribute to the revenue. They are mainly exempt from having to pay these taxes, but the actual payer is really the ultimate purchaser, and the peasant pays in that capacity. Possibly some realisation of this may account for the diminution of opposition to these taxes which is said to have been experienced in France. At first the complaint was that Paris and the industrial community in general were doing all the paying and the agriculturists were escaping. But if manufactured products and materials are taxed, while agricultural products are not similarly taxed, in such a manner that the tax is put on to the price of the goods, the agricultural community are not escaping the real burden; it is rather the non-agriculturists who are escaping, because if the transfer tax were applied equally to farm produce, the townsmen would have to pay it and the farmers, as far as they consume their own produce, would escape that part of the tax. Possibly the French urban communities are beginning to appreciate this.

So far as regards this country, there is little that is not common knowledge. There is a misleading statement on p. 43 that the Englishman "has a burden of local rates equivalent to national taxation." Actually, the total of local rates is only a fraction of the amount of the Exchequer revenue. The reason for the special relief provided by the budget of 1928-9 was the unevenness of the burden of rates, and the absence of any relation to profits.

All *per capita* comparisons of country with country are difficult

owing to the varying distribution of functions between central and local Governments, and varying methods of raising revenue for local Government. There seems little doubt, however, that Great Britain is the most heavily taxed country, per head, and probably per cent. of income. On the other hand, it might be pointed out that the marginal utility of money is doubtless lower generally in Great Britain than in most of the other countries of Europe, and it is likely that taxation, though heavy, does not cut into necessities or into savings, to the extent that might be supposed from a mere comparison of amounts per head or of percentages.

An omission from the book is the absence of any information about the countries not involved in the war, with the exception of a brief reference to the capital levy in Switzerland. C. F. B.

5.—*Germany under the Dawes Plan.* By Max Sering, LL.D., Dr. Rer. Polit., etc., Professor of Political Science at the University of Berlin. x + 251 pp. London: P. S. King & Son, Ltd. 1929. Price 10s. 6d.

Professor Sering's book is a conscientious exposition of facts and a moderate presentation of an attitude. He writes of Germany, and as a German; but he would be the last to make for his treatise any claim to finality of historical judgment.

The first part of the treatise deals with the formulation of the Peace of Versailles and the subsequent events leading up to the Dawes Plan. The significant feature of the period was the clash between French fears of German rehabilitation, and a more liberal apprehension of European chaos; Professor Sering detects traces of this conflict in the principal events of the period. He holds that even the experts of the Dawes committee were not immune from French influence, and that they based their plan upon the materialization of an export surplus, although "undoubtedly they were well aware that neither before nor since the war has any such surplus existed. But for obvious tactical reasons they never make any reference to the fact. To have denied the feasibility of achieving such an exportable surplus would have been equivalent to jeopardizing the acceptance of their scheme by France."

The Dawes scheme went agley, Professor Sering maintains, in ignoring Germany's fundamental lack of capital. Annexations and expropriations, war, the absence of intercourse abroad, the Ruhr occupation, had left German industries impoverished and factories substantially out of date. Over-populated as she was, Germany would in any event have had to borrow abroad; an economic surplus had given place to an economic deficit, and Germany had become a debtor country. The capacity to meet the Reparations bill, and to survive it, depended upon realizing an increased productivity sufficient, not only for the purpose in hand, but also to support the population. His case is that, crippled at the outset, Germany was in no position to undertake the task. Europe presented a closed door to German manufactures: territorial losses, the need for economic readjustment, and the war's legacy of debt (which led, in

the inflation, to impoverishment), were obstacles which any nation, however industrious, might fail to surmount. Professor Sering is at some pains to establish the fact of the shortage of capital, and to rebut the arguments of the Reichs-Kreditgesellschaft to the effect that, in 1927, about the same sum was available for home investment as in 1913.

Foreign loans, he holds, have done little to increase the remunerativeness of German enterprise, which shoulders the burden of dear money, high wages and heavy social contributions. The high rates payable for money in recent years have precluded the profitable use of new capital except in relation to "final needs"; unfortunately the needs of German industry were too often fundamental rather than final: the foreign loans have been needed for purchasing food-stuffs, and were not available for augmenting industrial productivity. The high rates paid do not, in Professor Sering's opinion, furnish any criterion of the earning power of money.

There has been a numerical correspondence between the amount of cash transfers and the industrial loans taken up abroad: there has been a similar correspondence between the payments in kind and the balance of long-term loans which, he contends, were needed primarily for the purchase of food-stuffs. In these cases of parallelism he traces a causal connection, and infers that the payments have, in fact, been made out of borrowed funds. Payments in kind have resulted in the acquisition of *rentes* by foreigners, in exchange for supplies of foodstuffs. Cash transfers have had a like effect; but, owing to the stronger borrowing power of the larger undertakings, this has resulted in a redistribution of purchasing-power, at the expense of the smaller concerns producing goods of fine quality. The foreign loans have admittedly set German economy at work again, but they have not cured the country's essential poverty. "The economic organism which seems so vigorous has to be artificially fed with fresh loans and credit, in a measure corresponding at least to the amount of reparation payments plus the value of the food-stuff shortage." He concludes that reparations and loan charges must represent an increasing burden, and that it is futile to expect an automatic equation of the trade balance of payments. The transference of reparations without further loans will quickly end the pseudo-prosperity which can exist only while the influx of capital exceeds the efflux. The profits of enterprise are small, and the price of money must remain high: in the end, the payment must come out of wages; and in this fact Professor Sering sees the shadow of a political crisis.

A. P. L. G.

6.—*Transfert des Reparations et le Plan Dawes*. By Harry D. Gideonse. 124 pp. Lausanne: Librairie Payot et Cie.

In this volume, although it is translated into French, we have an American view of reparations and war debts. Nearly all writers on these subjects, Professor Gideonse affirms, start with a theory and fit the facts to it. Our author begins by saying that the Dawes Plan was a political compromise, not, as so many allege, the dis-

interested opinion on an economic question of a group of experts. Still, it was the first step in the reparations question where economic analysis played an important part; indeed, Professor Gideonse calls it a revolution in the method adopted. The key to the Dawes Plan was that Germany had performed her duty when she had made the stipulated payments to the Agent-General in German currency; the Agent-General had then to transfer this money to the Allies without endangering the stability of the mark.

Our author discusses earlier payments on a large scale from one country to another, such as our own payments to the Continent during the Napoleonic wars, and the French indemnity to Germany after 1871. He suggests that our *real* payment took place after 1815, when British goods flowed over the Continent in great volumes. There is not much analogy with 1871, and the difficulties are vastly greater. Then France held large foreign investments; now Germany had sold her foreign investments during and after the war. After the Treaty of Frankfort, Germans complained of *les milliards empoisonnés*; the question is still unanswered—"Can the creditor nations accept payment without serious prejudice to their own economic organization?" Since a tariff acts as a prohibition on German exports, Mr. Gideonse thinks that preferential duties may have to be applied to German exports if the creditor nations really want payment. Various efforts have been made to regulate payments in kind, from which this country has been the chief sufferer, as, for example, by requiring Germany to provide material for public works in the French colonial empire. There were not many suitable enterprises, and their speedy exhaustion ought to teach the creditor nations how enormous are the totals of the annuities in terms of goods and services.

Professor Gideonse believes that the final solution depends largely on the Washington Government; he adds that inter-Ally debts cannot be separated from reparations. He reckons American advances to the Allies at 10,335 million dollars, and the agreed debts at 6,250 million. We are surprised to find him calculating that Great Britain may soon be receiving about 200 million dollars a year from her Allies and from Germany, while she will only be paying 184 million dollars to America. He quotes Mr. Mellon's statement when Secretary of the Treasury: "The entire foreign debt is not worth as much to the American people in dollars and cents as a prosperous Europe as a customer." The Professor declares that the payments already made to America through her loans to Europe have only postponed the difficulty of a final settlement. His last words are a warning to the Governments of the Allies and the United States that the financial arrangements of the Dawes Plan, if they do not undergo a series of prudent modifications, will end in "*un échec retentissant*."

J. E. A.

7.—*The Mexican Agrarian Revolution.* By Frank Tannenbaum. The Institute of Economics of the Brookings Institution, New York. New York: The Macmillan Company. 1929. xvi + 543 pp. 12s. 6d.

Die Bauernbewegung in der russischen Revolution, 1917. Von S. Dubrowski, Professor in Moskau. "Beiträge zum Studium der Internationalen Agrarfrage," herausgegeben vom Internationalen Agrarinstitut, Band I. Berlin: Paul Parey. 1929. 206 pp. Price Rm. 6.

The so-called "Green Rising" among the peasants of the agricultural East of Europe has produced far-reaching changes in the agrarian organization of the countries concerned, but only some of its more immediate consequences are as yet evident and its ultimate results, political, social, and economic, remain to be seen. This agrarian revolution in Europe has produced a considerable literature, from which students can obtain instruction of varying value, but much less has been known regarding the agrarian transformation attempted in Mexico. The agrarian issue in Mexico became a prominent feature of the revolutionary movement during the Great War, and the aspirations of the masses of rural population found expression in the Constitution of 1917. The provisions of this Constitution involved the expropriation of large tracts of privately owned land, the limitation of the rights of foreign landowners, the allocation of land to landless villages or those with insufficient holdings, internal colonization and other measures, including, first and foremost, the liberation of approximately one-half of the peasantry, namely the *peons* settled on large estates (*haciendas*), from serfdom, to which they had been reduced by the centuries-old accumulation of debts. Supplemented and developed by a large body of federal and local legislation, the Constitution of 1917 aimed at a complete transformation of the social and economic structure of the country and at ensuring its freedom from foreign control. Mr. Tannenbaum's painstaking and open-minded account of the conditions before the revolution, of the revolutionary legislation and its effects, gives a very good idea of Mexico, with its superimposition, under the Diaz regime, of extensive foreign capitalism on a semi-barbaric society, living primitively on the meagre economic foundation of native agriculture, carried on by methods handed down from times immemorial. Written in a dispassionate business-like manner, this account yet makes the reader feel that the clash had to come. The impression left by the perusal of the book is, however, that, on the whole, though the revolution had abolished bondage and thus raised the status of the *peon*, its social effects have so far been more important than its purely agrarian consequences. In fact, the proportion of peasants who have really benefited by the revolution is very small, and the area of land transferred to them, either in the form of village allotments or by individual settlement, is very limited. In so far as the provision of land to the *peons* settled on the *haciendas*, as distinguished from the peasantry of the free rural communities, is concerned, it would appear that

very little has yet been achieved. Foreign landowners, however, whose aggregate holdings represent about one-fifth of the total privately owned land in Mexico, have been dealt with drastically by both the Constitution of 1917 and the subsequent Organic Law of 1925. In fact, individual foreigners owning agricultural land were only permitted by the latter enactment to retain their holdings for their lifetime, while foreign corporations were ordered, within a period of ten years, to transfer at least 50 per cent. of their shares to Mexican citizens. The book is full of instructive information and is supplemented by detailed statistical appendices.

The author of *Die Bauernbewegung in der russischen Revolution*, who is a Professor under the Soviet regime, gives the reader an avowedly *ex parte* account of the Russian peasant movement. The whole development is presented in strict conformity with the neo-Marxian or Leninist theory of the social and economic evolution of rural Russia; and this forcing of facts into the Procrustean bed of preconceived ideas deprives the book of much of its potential value. Some statements are simply staggering. Thus, one learns that, in 1917, the Provisional Government, with Kerensky at its head and another Social Revolutionary, Chernov, as Minister of Agriculture, though it had definitely identified itself with an agrarian programme involving the confiscation of private estates and the nationalization of land, was representative of the "domination of large landowners and capitalists." Further quotations of similar curiosities would be tedious. The book, though it contains a certain amount of information concerning the peasant movement in Russia, is, first and foremost, an eulogy of Communists, published by the Communist International Agrarian Institute, whose stamp is as obvious on the contents as on the cover.

G. A. P.

8.—Other New Publications.*

Batten (Edward), M.I.Mech.E. *Nationalism, Politics and Economics*. 145 pp. London: P. S. King, 1929. Price 7s. 6d.

[Briefly stated, the purpose of this book is to advocate the counteraction of the burdens imposed on British trade as a result of foreign tariffs and internal taxation by the stabilization of domestic currency on the basis of export values, the gold standard being used for external payments only. Starting from the assumption that "the foreigner pays," the author proposes to spread over the whole nation the loss which now falls solely on "unsheltered" industries, by so "managing" the internal currency as to maintain its value at a level low enough to reduce the gold cost of the exports to the selling price less tariff or tax, by "a money which maintains the stream of trade in constant flow at the economic level of barter," maintaining "the volume of our external trade at the most nationally profitable level hostile tariffs permit," and securing that "individual profits and losses conform to those of the community." The book would be easier reading if the rules of punctuation had been better observed.]

* See also "Additions to the Library," p. 648 *et seq.*

Bradford (Frederick A.). Money. 403 pp. New York, London, Toronto: Longmans, 1928. Price 10s. 6d.

[This book, published in Longmans' Economic Series, is described by the author, who is assistant Professor of Economics at Lehigh University, as "an attempt to provide satisfactory text-book material on the subject of money," and it may be safely recommended for the purpose. Prof. Bradford's method of imparting knowledge is lucid and economical without being dry, and the fullness of the detail never obscures the broad lines of the subject. The general description of money and monetary systems occupies five chapters; the next three, which will perhaps not be those least appreciated by English students, are devoted to the monetary system of the United States, and the working of the Federal Reserve System is described in considerable detail. Later chapters discuss the value of money, the quantity theory, government and bank credit money and the value of the standard, the business cycle and its relation to monetary values, the control of credit, foreign exchange, gold movements and distribution, and the advantages and disadvantages of a managed currency. Each chapter is followed by a series of well-planned "questions for study," and bibliographical notes. There is also a good index.]

Confederazione Generale Fascista dell' Industria Italiana. Annuario 1928-29. 901 pp. Roma: Soc. an. tip. "Castaldi," 1929.

[This, the first year-book issued by the General Federation of Italian Industrialists, opens with the text of the decree conferring legal status on the organization, which is followed by the proceedings of the National Congress of Italian Industrialists, held in June, 1928, consisting of the opening speeches by the President, Signor Benni, and the Duce, and short papers and discussions by distinguished members on: science and industry, labour problems, rationalization, industrial credits, and exportation. The major portion of the volume is devoted to the proceedings of the General Assembly of Delegates and the text of the papers presented to them on behalf of the Federation. These dealt respectively with: Italy's economic position in 1927, industrial organization, the functions of economic organizations, problems of fiscal legislation, problems of labour; and detailed information, with copious figures, is brought to bear upon the questions discussed. A directory of the associated industrial federations is included in the volume.]

Demaria (Giovanni). Le Teorie monetarie e il ritorno all'oro. con prefazione di Gustavo del Vecchio. 245 pp. Torino: Flli. Bocca, 1928. Price 30 lire.

[This is the first volume of a new series of the Biblioteca di Scienze Sociali published by the firm of Bocca. The title hardly gives an adequate indication of the contents. The first ten chapters are, in fact, a treatise on monetary theory and monetary systems; the next two provide concrete illustration in the form of a detailed account of English monetary experience in the period 1914-26; while the last two consider the problems of price stabilization, with particular reference to the respective schemes of Mr. J. M. Keynes and Professor Irving Fisher. The treatment is very full and informative; there are numerous statistical tables and abundant bibliographical references. The author has evidently taken pains to make the history of war finance as complete as possible. His attention, however, may perhaps be directed to a misprint on p. 150 (*sterline* for *shilline*) which makes it appear that British currency notes were of the denominations of one pound and ten pounds.]

Schoolmeesters (Herman). Les Impôts, les lois sociales et la production. 159 pp. Paris: M. Giard; Bruxelles: A. Dewit. 1929. Price 25 francs.

[This book is in succession to an earlier work by the author, briefly noticed in the *Journal* for 1927. It is a study of the effects of taxation and of social legislation on the costs of production, with special reference to commodities produced under conditions of increasing costs.]

Research in the Social Sciences: its fundamental methods and objectives. Edited, with an introduction, by *Wilson Gee*. 305 pp. New York: Macmillan Company, 1929. Price 8s. 6d.

[The Institute for Research in the Social Sciences of the University of Virginia, which was founded in 1926, inaugurated its activities by inviting a series of lectures by eminent authorities in the various branches of Social Science, with a view to the guidance of the investigators in the choice of objectives and methods of research. These lectures are here published with an introduction by the Director of the Institute. They consist of: Sociology, by R. E. Park; Economics, by Allyn A. Young; Anthropology, by Clark Wissler; Statistics, by R. E. Chadlock; Psychology, by R. S. Woodworth; Jurisprudence, by Roscoe Pound; History, by A. M. Schlesinger; Philosophy, by John Dewey; Political Science, by C. A. Beard. In the 37 pages on Statistics, Professor Chadlock has contributed an able essay on the uses and limitations of statistical methods, with separate consideration of statistical induction, sampling, group research, measurement in the social sciences and in health work, the rational test of statistical analysis, the basis of forecasting, and analytical methods of forecasting population. He stresses the danger that "progress in statistical technique will outstrip the perfecting of methods for obtaining more complete and reliable data" and so lead to "factory methods." An especial merit of this section is the full bibliography, which will enable students to fill up the author's broad and suggestive outlines. The lecture on Research in Economics, by the late Professor Allyn Young, which is full of stimulating thought and valuable suggestion, also touches on the domain of statistics. The book is indexed, but the table of contents gives none of the subdivisions of the nine lectures, and, while these are here numbered in Roman figures, the titles appear at the heads of the separate lectures without any numbers, while Roman numerals are used for the subsections.]

Tivaroni (Prof. Jacopo). Compendio di Scienza delle Finanze. 7^{ma} ed., riveduta e aumentata. 443 pp. Bari: Laterza, 1929. Price 20 lire.

A handbook—in two senses, for the volume is of pocket size—of public finance, its principles, and its practice in various countries, especially in Italy. In the present edition, the first to reach the Society, two new chapters have been added, one (xi) giving a detailed account of the present organization of the Italian Ministry of Finance, with all its subordinate departments, the other (xxvii) on Special Taxation. The complex ramifications of the Italian administrative system correspond to the number and variety of the forms of taxation to which the nation is subjected; their examination occupies nineteen chapters (compared with one on state expenditure), not the least interesting being that dealing with the state monopolies and *priative*, chiefly salt, tobacco, quinine, lotteries and playing cards, the working of the lotteries being explained in detail. The "special taxes," separately treated in Ch. xxvii, are those devised to fall on particular classes, such as the war tax which was levied on those exempt from military service. At present these include taxes on state employees, the proceeds of which go

to the institutions for the assistance of their own class; taxes on the beneficiaries and confraternities of the Church, for ecclesiastical purposes, and on business men and merchant captains, for the maintenance of the Chambers of Commerce. The more general sections of the book include a chapter on the computation of national wealth and one on the theory of taxation. A list of books on public finance by Italian, French, Spanish, German, Austrian, English and American authors, is given in an appendix. Like most continental writers, Prof. Tivaroni provides no index, but makes some amends by a full table of contents. In future editions he might perhaps correct the statement on p. 41, evidently a survival from earlier issues, that members of the British Parliament are unpaid.]

Walsh (Correa M.). The Four Kinds of Economic Value. 138 pp. Cambridge (Mass.): Harvard Univ. Press, 1926. Price 8s. 6d.

[A philosophical analysis of the nature of economic value, the purpose of which is to show the gain in clarity of thought which would accrue from a more precise classification: that is, from the recognition in economic theory, and the distinction in economic parlance, of the several kinds of economic value, the term value itself being regarded as generic and reserved for the "main theme," and the species being Use Value, Esteem Value, Cost Value, and Exchange Value. The author begins with a history of the development of the conception of value and its gradual analysis, and proceeds to the definition and attributes of his four species—their objectivity, relativity, comparableness, variability, knowableness, measurement, and causation. Two of the short chapters are given up to Ricardo's theory of exchange value, and one to labour costs, while the last two discuss the practical uses of the measurements and the relation between monetary stability and economic value.]

CURRENT NOTES.

In the last number of the *Journal* British trade during the first five months of this year was reviewed, and now two more months come under consideration. May was a bumper month for British exports, their aggregate value, £67,437,000 having only been exceeded once in 1927-9, namely, in November, 1927, when, on a higher range of average values, they totalled £70,610,000. June showed a precipitous fall to £49,893,000, which was followed by a sharp recovery in July to £66,520,000. There is reason for believing that part of the fall in June was artificial. A period of six days is allowed within which exporters can send in particulars of the goods they have shipped, and it appears probable that there may have been some slackening of forward business in May owing to the holidays and the influence of the political situation, and that merchants used the opportunity to send in their documents promptly. June may thus have been robbed by May, and to some extent the increase in July may only represent a return to normal practice. The recovery, however, was too general and too large to be completely explained in this way, and there seems to be little doubt that there was a substantial development of export business last month. Since the war British export trade has been characterized by a certain jerkiness; there has been no continuous movement, but rather a series of spurts followed by relapses, though the trend has been generally upwards. This phenomenon seems to be due on the one hand to the presence of a large surplus of productive capacity which enables a sudden rush of orders to be taken care of at once instead of the supply of goods being spread over a period of time. On the other hand, the growing practice of purchasing only to cover immediate requirements instead of buying ahead, though, for example in the United States, it may smooth out the production curve for home trade, has the contrary effect in export trade. To the combination of these two factors is largely due that fluctuation in our trade which has puzzled and often disheartened observers.

Exports of coal were 5,848,000 tons in July, against 4,883,000 tons in June and 4,163,000 tons in July, 1928, and the average price per ton was about 3 per cent. greater than a year ago. Exports of iron and steel and manufactures thereof were 376,000 tons, compared with 307,000 tons in June and 333,000 tons in July, 1928, and nearly 70 per cent. of the increase over June was in the tonnage of finished goods; at the same time, retained imports of similar classes of goods were 236,000 tons, 2,000 tons more than in the previous month and 18,000 tons more than a year earlier, but nearly half of these imports were crude iron and steel. Machinery exports (52,000 tons) also showed substantial increases of 14,200 tons over June and 3,700 tons over July, 1928. Motor vehicles and chassis exported numbered 3,877 in July, or 940 more than in June and 1,486 more than in July, 1928, while retained imports were 4,176 in July against 4,635 in June and 1,495 in July, 1928. Textiles show similar gratifying recoveries from the low-points of June. Cotton piece-goods exported rose from 224 to over 355 million square yards and were about 5 per cent. greater than in July, 1928. Exports of woollen and worsted tissues were 72 per cent. greater than in June and less than 3 per cent. below those of July, 1928. Linen piece-goods, jute piece-goods, earthenware, cement, sodium compounds, paper, and wool stockings and hose, are conspicuous among many classes of exports that show large increases.

Among retained imports of raw materials, iron ore, timber, non-ferrous metals, and wood pulp are in a satisfactory position, but on the whole imports of oil seeds and nuts are less than a year ago. July being the last month of the cotton year, imports in that period have little significance, but it may be noted that, according to the statistics of the Liverpool Cotton Association, cotton forwarded to mills in the season 1928-9, just expired, amounted to 1,498 million lbs., or nearly 1½ per cent. less than in the preceding season of 1927-8. Port stocks of cotton in the United Kingdom were 367 million lbs. at the end of July, 1928, and 397 million lbs. at the end of July, 1929. Retained imports of sheep's and lambs' wool were nearly 2½ times as much in July, 1929, as in July, 1928, and in the first seven months of this year they aggregated 379 million lbs., or about 2 million lbs. more than in the corresponding period of 1928. Retained imports of refined petroleum were 128 million gallons in July, 1929, 111 million gallons in June, 1929, and 153.5 million gallons in July, 1928; in the first seven months of 1929 there was

an increase of a little over 2 per cent. above the retained imports of the first seven months of 1928. Turning to food-stuffs retained, imports of wheat were about 402,000 tons in July, 1929, compared with 485,000 tons a year ago, but over the first seven months of the year there was only a reduction of 26,000 tons in 1929. Taking all kinds of meat together there was a slight increase in retained imports in July, 1929, over July, 1928, but over the seven months of the year there was a slight decrease. There was not much change in imports of butter in July, 1929, compared with July, 1928, but a moderate increase in cheese; in both cases imports increased over the first seven months of the year taken as a whole. Retained imports of tea in July were about 14 per cent. greater than a year ago, and retained imports of unrefined sugar increased by about 37 per cent. Retained imports as a whole aggregated in value £85,581,000 in July, 1929, against £81,882,000 in June, 1929, and £87,035,000 in July, 1928.

In July 5,853 vessels of 5,962,000 net tons entered with cargoes, and 6,019 of 6,183,000 net tons cleared with cargoes at British ports; this was a remarkable increase over June, when 5,335 vessels of 5,355,000 net tons entered and 5,302 of 5,746,000 net tons cleared with cargoes, and also over July, 1928, when entrances with cargoes were 5,438 vessels of 5,438,000 net tons and clearances 5,192 vessels of 5,489,000 net tons. The British share in this traffic was:—Entrances: July, 1929, 3,171 vessels, 3,899,000 net tons; June, 1929, 3,043 vessels, 3,486,000 net tons; July, 1928, 2,921 vessels, 3,650,000 net tons. Clearances: July, 1929, 3,905 vessels, 4,190,000 net tons; June, 1929, 3,496 vessels, 3,915,000 net tons; July, 1928, 3,385 vessels, 3,770,000 net tons.

Movements and Classes.	Twelve Months ending July, 1929.	Twelve Months ending July, 1928.	Increase (+) or Decrease (—).
Imports, c.i.f.—	£'000.	£'000.	£'000.
Food, drink, and tobacco	543,319	526,603	—16,716
Raw materials and articles mainly un- manufactured	340,081	332,048	— 8,033
Articles wholly or mainly manufac- tured ...	316,069	324,109	+ 8,040
Other articles ...	8,976	11,691	+ 2,715
Total Imports ...	1,208,445	1,194,451	—13,994

Movements and Classes.	Twelve months ending July, 1928	Twelve months ending July, 1929.	Increase (+) or Decrease (—).			
Exports, f.o.b.—						
<i>United Kingdom Produce and Manufactures—</i>	£'000.	£'000.	£'000.			
Food, drink, and tobacco	53,302	55,468	+ 2,166			
Raw materials and articles mainly un- manufactured	71,603	75,409	+ 3,806			
Articles wholly or mainly manufac- tured ...	583,904	580,090	— 3,814			
Other articles ...	17,927	21,605	+ 3,678			
<i>Imported Merchandise—</i>						
Food, drink, and tobacco	26,958	26,377	— 581			
Raw materials and articles mainly un- manufactured	70,466	58,309	—12,157			
Articles wholly or mainly manufac- tured ...	25,353	27,846	+ 2,493			
Other articles ...	212	413	+ 201			
Total Exports ...	840,725	845,517	— 4,208			
Bullion and Specie—						
Imports ...	46,941	58,530	+11,589			
Exports ...	45,120	85,480	+40,360			
Movements of Shipping in the Foreign Trade—	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.	Number of Vessels.	Thousand Net Tons.
<i>Entered with cargoes—</i>						
British ...	32,633	40,462	31,623	23,021	—1,010	—17,441
Foreign ...	26,115	19,927	24,883	12,688	—1,232	— 7,239
Total entered ...	58,748	60,389	56,506	35,709	—2,242	—24,680
<i>Cleared with cargoes—</i>						
British ...	39,932	44,605	37,831	42,578	—2,101	— 2,027
Foreign ...	22,511	22,187	21,711	20,945	— 800	— 1,242
Total cleared ...	62,443	66,792	59,542	63,523	—2,901	— 3,269

In the course of July the Board of Trade issued its usual calculations of the volume and value of British overseas trade in the first half of the year. Taking as a basis the corresponding periods of 1924, the trade of successive later quarters has been revalued at the average values of the earlier base periods, so that the relation between the volumes of trade in the different periods can be determined by eliminating price changes, and also the effects of the price changes can be measured. Both in imports and in exports the

second quarter of 1929 showed a slight relative recession on the first quarter. The volume of imports was 15·7 per cent. greater in the first quarter of 1929 than in the first quarter of 1924, and 15·0 per cent. greater in the second quarter of 1929 than in the second quarter of 1924, and the respective increases in British exports were 9·2 and 8·0 per cent. Exports of imported goods, as usual, fluctuated more violently, being in the first quarter of 1929 23·6 and in the second quarter 6·9 per cent. below similar exports in the respective base periods. Average values of imports changed but little in the first half of 1929, the fall below the respective 1924 values being 22·3 per cent. in the first quarter and 22·4 per cent. in the second. Average values of British exports, on the other hand, continued the decrease which characterized 1928, the reduction below 1924 being 14·8 per cent. in the first and 16·3 per cent. in the second quarter. Comparing the second quarters of 1929 and 1924, this year has shown increases of 0·5 in the volume of retained imports of food, drink, and tobacco, of 24·5 in raw materials, and of 45·3 per cent. in manufactured articles (including semi-manufactured non-ferrous metals and refined petroleum). A similar comparison of the volumes of British exports shows increased of 39·8 per cent. in food, drink, and tobacco, of 4·9 per cent. in raw materials, and of 7·1 per cent. in manufactured articles.

Another periodical calculation made by the Board of Trade relates to the distribution of our overseas trade. After certain adjustments have been made in order to preserve comparability with 1913 as far as possible, the broad results are as follows. In the first six months of 1913 imports were derived as to 75·01 per cent. from foreign countries and as to 24·99 per cent. from the British Empire, whereas in the first six months of 1928 the corresponding percentages were 71·88 and 28·12, and in the first six months of 1929 they were 71·81 and 28·19. The share of our import trade held by the Self-Governing Dominions increased from 13·82 per cent. in 1913 to 17·38 per cent. in 1929, that of the Crown Colonies, Protectorates, etc. increased from 5·70 to 6·02 per cent., but that of India fell from 5·47 to 4·79 per cent. With regard to British exports, 62·95 per cent. of the total went to foreign countries and 37·05 per cent. to Empire countries in the first half of 1913; in the first half of 1928 the respective shares were 59·12 and 40·88 per cent., and in the first half of 1929 they were 59·07 and 40·93 per cent. The Self-Governing Dominions took 20·26 per cent. of our total exports in 1929 against 17·81 per cent. in 1913, and Crown Colonies, Protectorates, etc. 8·85 per cent. against 5·91 per cent., but those

increases were in part offset by a decrease in the case of India from 13.33 in 1913 to 11.82 per cent. in 1929.

The annual tables issued by the Board of Trade in which the numbers of seamen employed on vessels registered in this country are shown, and a broad classification by age, nationality and class of occupation is provided, contain, in the latest issue, an interesting comparison of the distribution, among different routes, of the vessels holding sea-going passenger certificates issued by the Board of Trade, at two periods of the year 1928, namely, at the end of April and the end of September. The autumn enumeration shows a somewhat larger number of such vessels employed, 422 as against 415 in the spring, but the increase is more than accounted for by the coasting and home trades, in which 126 vessels were engaged in the autumn as compared with 106 in the spring. Apart from these, there was a decrease from 309 to 296 in number, and from 3,341,811 to 3,315,626 in gross tonnage. For all the vessels together there was a trifling increase of 2,283 in the gross tonnage. The total number of seamen employed was, like the aggregate tonnage, almost the same in the autumn as in the spring, namely, 64,707 as compared with 64,322. For the vessels outside the coasting and home trades the aggregate of the crews was 60,211 in the autumn and 60,637 in the spring: both the deck and engine-room staffs were slightly smaller at the autumn count, while the stewards and other staff concerned with personal service were somewhat more numerous. There was a good deal of variation in the vessels employed on different routes, but the most conspicuous change was an addition of 20 vessels to the 35 engaged in the North American passenger service in the spring, while vessels engaged in pleasure cruising decreased from 16 to 3. It is noteworthy that all the routes on which passenger vessels of between 10,000 and 14,000 tons gross were employed showed fewer of such vessels in the autumn than in the spring.

As shown by the quarterly reports in the *Board of Trade Journal*, the number of emigrants during the first six months of the current year, though less than half the number recorded for 1913, shows an increase of nearly 10,000 on the number recorded for the first half of last year. Canada has been the destination of 57 per cent. of the British emigrants during the first half of 1929 as compared with 44 per cent. during the first six months of 1928. For the twelve months ended June these percentages have been 47 in the latest and 34 in the preceding period. It is necessary to go back five years to find larger figures of British emigration to the Dominion. Meanwhile Australia and New Zealand, which, in the years ended June

1925, 1926 and 1927, attracted more of our emigrants than did Canada, show a reduced attraction in each of the two following years: together they accounted, during the twelve months to June this year, for less than 27,000 of our emigrants, as compared with somewhat over 69,000 leaving for Canada, of whom 43,500 have left in the months January to June of the current year.

It is of interest to note signs of increase in the activity of travel, not only to the Continent, but also to overseas countries. The passengers direct to the latter, omitting emigrants, and those inwards direct from overseas countries, omitting immigrants, represent the business and tourist travel. Both from the figures relating to ocean traffic, and from those of continental traffic, it would appear that the movement of travellers of British nationality—whether resident in the United Kingdom, in other parts of the British Empire or in foreign countries—is somewhat greater outward from the United Kingdom than inward, while in the continental traffic there appears to be a small inward balance of British subjects. This seems to mean that it is somewhat more frequent in the tourist traffic, if not in business travel, that a landing from distant continents at ports in European countries is followed by a crossing to Great Britain from that or another European country than that a landing at a British port at the end of a direct voyage from the distant country is followed by a departure *viâ* a port on the European continent.

The total of passengers from the Continent, which was just over 1,300,000 in 1913, was hardly 1,150,000 in the year ended June, 1924, but, advancing year by year, was practically 1,500,000 in the year ended June, 1929. The outward movements were smaller, mainly on account of the passage of continental emigrants through this country to their overseas destination, but this does not account for more than about 2 or 3 per cent. of the total arrivals from the continent of Europe. The great bulk of the continental passenger traffic is concerned with business and pleasure trips made by residents here to the Continent or to this country by residents on the Continent. The corresponding movement in the ocean traffic amounted to between 130,000 and 135,000 in the year ended June, 1929, so far as British subjects are concerned. There are no data for determining how many of these voyages were made by residents in this country, how many by residents overseas. That the traffic is growing is clear from the series of yearly figures, the journeyings being more numerous by something like 20,000 than they were four years ago.

As measured at the Board of Trade, the general level of wholesale prices was lower in May than in April by 2.0 per cent., the index-numbers for the two months being 81.7 and 83.4 respectively (1924 =

100). The reduction of food prices by an average of 2.5 per cent. was due to falls of 3 per cent. for cereals and 4 per cent. for miscellaneous foods, while meat and fish prices remained on the balance unchanged. In the case of industrial materials, where the average decline was 1.7 per cent., the greatest reduction was one of 4.5 per cent. for metals and minerals other than iron and steel, and iron and steel prices themselves with an increase of 0.5 per cent. provided the only exception to the downward movement. After the fall in values generally which took place in April and May, wholesale prices for the month of June showed little change on balance compared with the preceding month, and the index-number for that month was 81.6. Food cheapened by 0.1 per cent., and industrial materials by 0.2 per cent. Of the 150 price averages upon which this index-number is built, the comparison of June with May revealed 43 increases and 49 decreases. Taking the average of 1913 as 100, the index for all articles for June was 135.6, the figures for the 53 articles of food and for the 97 industrial materials being 143.4 and 131.2 respectively. For the smaller groups included in these, the indices ranged from 114.7 for iron and steel to 154.2 for cotton and 155.3 for miscellaneous food-stuffs.

According to the *Economist* index-number of wholesale prices the downward trend in the course of wholesale prices which took place in April was accentuated during May. The returns for the end of May showed a drop of 2.7 per cent. on the month, and a drop of 10.4 per cent. in comparison with May, 1928. According to the new basis of this index-number in which prices for 1927 = 100, the level at the end of May was measured by a figure of 91.3. During June the *Economist* recorded a steadier level of wholesale prices on balance, and at the end of the month the index was about one-fifth of 1 per cent. up at 91.7; cereal and meat prices were 2.7 per cent. up, but other foodstuffs were cheaper by 0.2 per cent.; textiles were down by 2.3 per cent., and miscellaneous materials were also a fraction cheaper, but mineral prices rose by 0.6 per cent. Expressed as a percentage of the average for 1913, the *Economist* index-number in the second quarter of the year showed a fall from 138.1 to 131.7, or 4.6 per cent., a movement which, it is suggested, shows a response in wholesale prices to the influence of relatively dear money. At the end of June, while the complete index, as stated above, was on this basis 131.7, this covered variations from 103.6 for miscellaneous materials to 145.5 for textiles and 170.1 for miscellaneous food-stuffs. The tendency, however, of price groups to recover their pre-war "balance" in relation to each other is revealed by the calculation of its index-number on the base of 1924 prices, which is also given by

the *Economist*. On the 1924 basis the general index-number for the end of June was 79.2, and the groups showing the largest decreases since 1924 are just those, e.g. miscellaneous foods (78.8) and the textiles group (67.8), which in 1924 were raised out of proportion to the general mean figures.

As measured by the *Statist* index-number, the downward movement of wholesale prices continued unchecked during May, the figure for the end of May, viz. 113, being the lowest monthly figure recorded by this index-number since October, 1915. It was 3 per cent. lower than that for the preceding month and 10.5 per cent. lower than that for the end of May, 1928, and reduced the rise of sterling prices since the outbreak of the war to 39.2 per cent. The weakness of the sterling exchange in terms of many other gold currencies which accompanied this downward movement of prices is explained by the *Statist* by a table of index-numbers for various countries which suggests that in their fall sterling prices were conforming to a general trend of gold prices throughout the world, for which the abnormal credit conditions in the United States were mainly responsible. After months of declining prices, the index-number for the end of June (113.1) showed that although the fall was then checked, no appreciable recovery had set in.

According to the returns collected by the Ministry of Labour as to movements of retail prices in Great Britain and Northern Ireland, between May 1 and June 1 there was a further seasonal decline in the average level of retail prices of food, together with a slight decrease in the prices of bacon and flour, while the prices of other non-seasonal food-stuffs remained unchanged. Expressed as a percentage of the average prices in July, 1914, the level between the dates mentioned fell from 149 to 147, as compared with 156 on June 1, 1928. During June eggs and butter became somewhat dearer, and these changes, combined with the substitution of new crop for old crop potatoes in the return on July 1, raised the general level on the latter date again to 149, as compared with 157 a year before. If account be taken of all the items included in the family budget in addition to food, the index of general retail prices, which stood at 161 on May 1, fell to 160 on June 1 and recovered by one point again to 161 on July 1, as compared with 165 on July 1, 1928. Since the expenditure on food represented 60 per cent. of the total expenditure in the original family budget, it would appear that the level of retail prices other than food remained at approximately 179 in May and June, the principal items in this average being rent (153), clothing (215 to 220) and fuel and light (170).

The following table summarizes for the principal countries the latest information as to retail prices overseas as reproduced in the *Labour Gazette*. The third column gives the estimated percentage increase in retail food prices on those ruling in July, 1914, or some similar pre-war period; the fourth column gives the estimated percentage increases for all items covered by the Budget in each case, such items, in addition to food, comprising, generally, rent, clothing, fuel and light, and other household requirements.

Country.	Date of latest return.	Food.	All Items.
		Percentage increase.	Percentage increase.
<i>Overseas Dominions, etc.</i>			
Australia	May, 1929	60	46 (4th qr. 1928)
Canada	June, 1929	49	56
India (Bombay)* ...	June, 1929	44	47
Irish Free State ...	April, 1929	64	73
New Zealand	May, 1929	48	61 (April)
South Africa	May, 1929	19	32
<i>Foreign Countries.</i>			
Belgium	June, 1929	—	767
Czechoslovakia (Prague)	May, 1929	806	636
Denmark	April, 1929	50	74
Egypt (Cairo)	February, 1929	45	—
France (Paris)	June, 1929	524	456 (2nd qr.)
France (other towns) ...	May, 1929	483	—
Germany	June, 1929	54	53
Holland (Amsterdam) ...	March, 1929	—	69
Italy	May, 1929	463	442 (Milan)
Norway	June, 1929	56	79
Spain (Madrid)	April, 1929	84	—
Sweden	June, 1929	49	71 (April)
Switzerland	May, 1929	54	60
United States	May, 1929	50	71 (Dec. 1928)

* Native families.

With reference to statistics relating to employment in Great Britain and Northern Ireland quoted on p. 469 of Part III, 1929, of the *Journal*, the *Labour Gazette* observed during May a general continuation of the improvement in the position, but during June, while the improvement continued in a considerable number of industries, it was balanced by a decline in employment in the iron and steel, motor vehicle, pottery, woollen and worsted, and lace industries, so that the position at the end of the month showed no general change. Among the workpeople, numbering approximately 11,880,000, insured against unemployment in Great Britain and Northern Ireland, the percentage unemployed in all industries taken together was 9.9 on May 27, the figure at which it had also stood a month before on April 22. On June 24 this percentage stood

at 9.8, showing an improvement on the position of a year before, when it stood at 10.7 on June 25, 1928. The total number of applicants for employment registered at Employment Exchanges in Great Britain and Northern Ireland, which was 1,198,000 on April 29, fell to 1,165,000 on May 27, then rose slightly to 1,176,000 on July 1; this last figure was below that of a year before, when the number was 1,264,000 on July 2, 1928.

Official statements as to employment in Germany quoted from the *Reichsarbeitsblatt* by the *Labour Gazette* showed a general improvement during April, which continued during May. During April the number of workpeople reported by the Labour Exchanges as seeking work fell from 2,100,000 to 1,800,000, and during May this number was further reduced to less than 1,500,000. Returns from national trade unions with a total membership of over 4½ millions showed a percentage of unemployment among their members amounting to 11.1 on April 27, as compared with 16.9 on March 30; on May 25 this percentage had fallen further to 9.1, which was still considerably in excess of 6.3, the figure at the end of May, 1928. In France during May and June the amount of unemployment, as measured by the number of unemployed persons remaining on the "live register" of the Exchanges, remained purely nominal, the figure being still below 10,000. In the case of Norway the trade union percentage of unemployment fell from 16.6 to 15.2 during March, and further to 12.3 by the end of April, this last figure showing a marked improvement on the position of a year before, when the percentage was 18.5. In Sweden at the end of May the corresponding trade union percentage indicated a position exactly equal to that of a year before, the figure on both occasions being 8.1. In the third Scandinavian kingdom returns supplied to the Danish Statistical Department by trade unions and by the Central Employment Exchange showed that out of approximately 272,000 workpeople, 13.7 per cent. were unemployed at the end of April, as against 23.3 per cent. at the end of the preceding month. By the end of May the figure had fallen further to 11 per cent., which also marked an improvement on the figure of 14.2 per cent. at the end of May, 1928.

In the last issue of the *Journal* a brief reference was made to the change of the basis of the index-number of employment in Canada. Information received since then directly from the Dominion Bureau of Statistics enables us to supplement that brief statement. The base used up to the end of last year, viz. the volume of employment in January, 1920, is now felt to be obsolete, besides possessing the disadvantage of being a single-month base in a highly abnormal

period. After much deliberation it was decided that the new base should be the average of the 1926 pay-rolls of the reporting firms, and the 1928 Annual Review of Employment was enlarged to give a continuous comparison upon this new basis. As to the method used in converting the 1921-28 indices, the index-numbers in the past had reflected the change in the employment afforded by the reporting firms for any month from that afforded by the same firms in January, 1920, as 100 per cent. The 1920 factor in the indices having been constant throughout the record, it was only necessary to find the percentage relationship between the 1926 average index for any particular industry and that for the same unit in other months in order that this new index might express for the particular month the relationship between the current situation in the industry and its 1926 average employment. This method has accordingly been followed in recalculating upon the 1926 base the indices for past months. As to the future, the use of the figures for 1920 will cease and the indices will be based directly upon the average 1926 returns as 100 in each case. For purpose of future reference, the revised indices from 1921 onwards, including the latest figures reported in the *Labour Gazette*, are given in the following table:—

Index-Number of Employment in Canada.

On the first day of	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.
January ...	88.1	78.8	87.3	89.8	84.9	90.7	95.9	100.7	109.1
February ...	91.2	79.9	90.6	91.7	87.1	91.8	96.6	102.0	110.5
March ...	89.1	82.0	91.0	91.8	88.1	92.6	97.5	102.6	111.4
April ...	85.1	81.8	88.7	90.4	88.3	92.5	97.4	102.3	110.4
May ...	85.1	84.3	92.5	92.9	91.9	95.4	101.8	106.8	116.2
June ...	87.7	90.3	98.5	96.4	95.6	102.2	107.2	113.8	122.4
July ...	88.6	92.2	100.7	97.1	98.0	105.0	109.7	117.7	
August ...	90.0	94.2	101.4	95.8	97.5	105.5	110.5	119.3	
September	89.8	94.8	101.2	94.2	97.8	106.2	111.0	119.1	
October ...	91.3	95.8	100.7	95.0	99.5	106.5	110.3	118.8	
November...	91.3	97.0	100.0	94.1	98.3	104.0	108.8	118.9	
December ...	88.3	96.3	96.9	91.9	96.5	102.3	108.1	116.7	

The monthly report on employment issued by the Federal Department of Labour Statistics at Washington is now based upon returns received from over 31,100 establishments employing approximately 5 million workpeople. On this basis it showed an increase in the volume of employment amounting to 0.5 per cent. between March and April, and in May there was a further increase of 0.2 per cent. The index-number of employment which continues to rest upon returns received from over 12,000 establishments in 54 of the chief manufacturing industries, and has as its base the same period as the

Canadian index-number, viz. the average monthly employment in 1926, rose from 98.6 in March to 99.1 in April, and by a further slight increase to 99.2 in May. For May, 1928, the index-number was 93.

We welcome the appearance of a new economic publication, *Contributions to Canadian Economics*, Vol. I, 1928. Professor Urwick in a prefatory note explains that the Department of Economics of the University of Toronto, feeling with the other universities the need of a special medium for the publication of contributions dealing with the economic problems of Canada, has issued this initial volume in the hope that it may be repeated annually, and may in future draw upon all Canadian economists for articles instead of, as on this occasion, only members and students of that Department. The opening article is "An Introduction to Canadian Economic History," by the late Professor James Mavor, and it is followed by three others of statistical importance—"Fertility of Marriage in Canada," by Hubert R. Kemp, "Cycles of Unemployment in Canada," by G. E. Jackson, and "The Size of the Establishment in Canadian and American Industry," by V. W. Bladen. Mr. Harold A. Innis contributes two bibliographies—a "Bibliography of Research Work," which is a *catalogue raisonnée* of "studies which have been prepared by undergraduates and graduates of the University of Toronto in the Department of Political Science" but have not been published through lack of funds, and "A Bibliography of Publications on Canadian Economics during 1927-28." The volume is published by the University of Toronto, price 50 cents. Everyone interested in Canada should wish the new enterprise a long and useful life and should contribute, in the obvious manner, to its success.

Considerations of space have always led the editors to exclude from the pages of the *Journal* reviews of purely economic works, but in the case of so old and valued a colleague as Professor Cannan they cannot refrain from drawing attention to his recently published book, *A Review of Economic Theory* (P. S. King & Son, Ltd., price 16s. net, pages x + 448). Referring in his preface to his previous *History of the Theories of Production and Distribution in English Political Economy from 1776 to 1848*, he says with characteristic frankness of the present volume, that "it is much less a supplement to the earlier work than a rendering in book form of the substance of the course of about sixty lectures entitled 'Principles of Economics, including the History of Economic Theory,' which I gave to second and third year students at the London School of Economics for many years down to June, 1926." If we omit one of the latest styles

of economic treatise where the authors confine themselves to descriptions of economic structure held together by a thin dilution of theory, the reader is apt to obtain from any work on the principles of economics the impression of a doctrine both hard and abstract. The study of the several ideas, each from its germination to its fruition, shows, on the other hand, a fluid doctrine slowly adapting itself to the better knowledge of changing facts. Because science is measurement, some have thought that economics are destined to be swallowed by statistics, but statistics require for their comprehension acquaintance with the facts underlying them and a knowledge of the means of interpreting those facts. It is the merit of Professor Cannan that he makes his readers more capable in this regard. He concludes his preface by saying that his title has been chosen "to disarm the criticism of those who would complain of omissions. A reviewer always does well to say what he wants to say and leave the rest out." This thoroughly Cannan-like remark justifies the ending of this Note at the present point.

The generosity of Mr. Udny Yule has enriched the Society's library with two very scarce works of Johann Peter Süssmilch (1707-67), sometimes regarded as the father of Vital Statistics, although that title properly belongs to John Graunt.

One of the tracts, which seems to have escaped the notice of biographers, is an octavo of 39 pages, *Dissertatio de Cohæsione et Attractione Corporum*, printed at Jena, the author's thesis for the degree of doctor defended on April 26th, 1732. The thesis is that the cohesion of particles does not require the postulation of laws of attraction and repulsion. Although reference is made to Newton and other great contemporaries, the treatment is scholastic rather than mathematical, and might have seemed a little old-fashioned even in 1732, but evidently satisfied Süssmilch's professors. Professor Erhardt Hamberger expresses the wish that the author's fatherland may speedily obtain from him the *fructus insignes* which it is justified in looking for.

The second tract—*Versuch eines Beweises dass die erste Sprache ihren Ursprung nicht vom Menschen, sondern vom Schöpfer erhalten habe*—an octavo of 124 pages printed in Berlin in 1766, is a product of the author's riper meditations. It is the text of a communication made to the Royal Prussian Academy of Sciences ten years before. According to one biographer, this memoir secured Süssmilch's admission to that learned body. In the preface the author says that he had intended to revise the work, but that ill-health (following a paralytic stroke three years before) had made that impossible.

Süssmilch's argument amounts to this:—Intellectual life is

impossible without speech, but all explanations of the origin of human speech—*e.g.* that of Maupertuis—assume that men did behave rationally before they had speech, therefore all these explanations are false and speech was a direct gift of the Creator. There is not, perhaps, much to be said for the logic (although equally defective logic is to be found in papers written *since* 1766 by men almost as eminent as Süßmilch), but it is gratifying to possess even the minor writings of one who did great and honourable service in the cause of statistical science. The Society now possesses three rare works of Süßmilch.

OBITUARY.

SIR ALFRED EDMUND BATEMAN, K.C.M.G.

THE death of Sir Alfred Bateman on August 7th severs a connection of fifty-two years with the Royal Statistical Society and marks the passing of one of the few survivors of the Civil Service of a period which seems almost legendary to the men of the present day. In him the Society mourns a talented, industrious, and kindly colleague.

Alfred Edmund Bateman was born in 1844 and educated at Repton and Brighton College. He entered the Ecclesiastical Commission in 1863, but in the spring of 1865 he obtained an appointment in the Registry of Designs, Board of Trade, in which Department he became a few months later a Junior Clerk. He was at first engaged on statistics, and for his labours on the "new work" of the agricultural statistics of 1866 he secured official commendation. Afterwards, and for the rest of his career, he was concerned with trade and commercial questions in that section of the Board which dealt with commerce and statistics, and among those with whom he was there associated were Sir Louis Mallet, Sir T. H. Farrer, and Sir Robert Giffen. He was joint-secretary of the Royal Commissions for the French Commercial Negotiations in 1877, 1881, and 1882, where his work again secured high official approval. This appointment was followed by further international activity as secretary to the International Sugar Conferences of 1887, 1888, and 1889, and as British delegate for Portuguese and Spanish Commercial Negotiations in 1892 and 1894. The reorganization of the Board of Trade in 1884 brought him promotion to the rank of Principal in the Commercial Department, and in 1894 he became Deputy Comptroller, and in 1897 Comptroller-General of the reconstituted Department for Commerce, Labour, and Statistics. In this capacity he served on the Committee for Chinese Indemnity and Tariffs in 1901-2, and in virtue of his general knowledge of affairs and his ability as a statistician he sat on the Committee on Scotch Fiars Prices in 1900-2, as previously he had been a member of the Committee on Prison-made Goods in 1895.

His main activity at the latter part of his official life was with the work thrown on his Department by the tariff controversy started by Joseph Chamberlain, and as Comptroller-General he was respon-

sible for the collection of memoranda, statistical tables, and charts known as the "First Fiscal Bluebook," issued in the autumn of 1903. The strain was, however, too great for him and he retired from the public service on the ground of ill-health at the end of that year. He had been created K.C.M.G. in 1900, and after retirement he had the further honour that successive Governments valued his advice so highly that retirement became for him but a change of occupation. From 1900 he had been Deputy Chairman and from 1901 Chairman of the Advisory Committee on Commercial Intelligence (out of whose proceedings arose the present Department of Overseas Trade), and he continued to serve till 1905. He was a member of the Royal Commission on Food Supply in Time of War (1903-5), and as Chairman of a Sub-Commission of the Royal Commission on Shipping Conferences (1906-9) he visited South Africa in 1907. He was Chairman of the Committee on International Exhibitions in 1906-7, chairman of the Anglo-French Pilotage Committee in 1910-11, British delegate at the Industrial Property Conference at Washington in 1911, British delegate at the Exhibitions Conference at Berlin in 1912, joint manager of the Imperial Institute 1905-16, a chairman of Labour Arbitration Courts and of the London Advisory Committee of Labour Exchanges, 1910-17; as a member he accompanied the Dominions Royal Commission in its Empire tours, and was chairman in Newfoundland and Canada in 1914 and 1916; finally, he was Chairman of the Enemy Exports Committee 1916-19. His public activities thus continued till but a few years before his death, increasing frailty at last compelling him to rest. Despite all his preoccupations in the last quarter of a century, however, he was keenly interested in the work of the younger generation of literary men, and did much to assist their organization.

As already mentioned, his membership of the Royal Statistical Society dates from 1877. Two years later he was elected to the Council, and from 1882 to 1896 he was an Honorary Secretary, till in 1896 he was made Vice-President by Mr. John Biddulph Martin, on whose death he was appointed President in April, 1897, and held the post till the election of Mr. Leonard Courtney in June of the same year. Thereafter he continued to serve the Society on the Council and Executive as Honorary Vice-President, attending zealously till only a few years ago. He often took part in the discussions at meetings of the Society, and though he never read a paper, he contributed to the *Journal* several communications which were mainly summaries of matter which had appeared elsewhere. The titles and dates are: 1878, Statistics of Canada (British Association); 1883 and 1884, Wine Production in France (National

Association of Social Science); 1885, Customs Tariffs (British Association); 1887, Statistics of Foreign Trade and What they Tell us (British Association); 1894, Comparability of the Trade Statistics of Various Countries.

He was one of the founders of the International Institute of Statistics, and was representative of the Board of Trade at the first ten biennial conferences, serving on several occasions as *rapporteur* of the Committee on Trade Statistics.

Sir Hubert Llewellyn Smith, who succeeded Sir Alfred in 1903, contributed to *The Times* of August 8th an appreciation of his former chief from which we make the following quotation :

" Few realize the debt which modern commercial diplomacy owes to Sir Alfred Bateman, who, though the least ostentatious and most self-effacing of men, often reached his goal through his steady tenacity of purpose, grip of essentials, wide knowledge, and sound judgment. But at the present moment those who, like myself, had the good fortune to serve under him will think of him in the first place as a most generous and kindly chief, unfailing in courtesy, consideration, and loyalty to every member of his staff. In him we all mourn the loss of a great public official of the old school, who did much to uphold the highest traditions of the Civil Service and to permeate his colleagues and subordinates with the same spirit."

" Courtesy, consideration, and loyalty " were what his colleagues on the Council and the officers of the Society always experienced from him.

STATISTICAL AND ECONOMIC ARTICLES IN RECENT PERIODICALS.

UNITED KINGDOM—

Banker's Magazine—

June, 1929—The proposed new bank. The Premier and the bankers. Recent tendencies in international banking: *F. von Mendelssohn*.

July, 1929—The banking half-year. Reparations and the new bank. Progress of banking in Great Britain and Ireland during 1928.

East India Association, Journal, July, 1929—Health progress in India: *Sir Thomas Carey Evans*. A national script for India: *A. Latif*.

Economic Journal, June, 1929—Organised marketing in the coal industry: *Prof. J. H. Jones*. The reparations problem: a discussion. I. Transfer difficulties, real and imagined: *Prof. B. Ohlin*, II. A rejoinder: *J. M. Keynes*. The monetary theory of the trade cycle: *Prof. A. C. Pigou*. The theory of international trade reconsidered: *Prof. J. H. Williams*. Ricardo on Malthus: *James Bonar*.

Eugenics Review, July, 1929—Reform of vital statistics: *Sir Bernard Mallet*.

Financial Review of Reviews, July–September, 1929—Transport costs and conditions: *E. T. Good*. The British coal-mining industry: *J. B. C. Kershaw*. The shipbuilding industry: *S. M. Gluckstein*.

Public Administration, July, 1929—The professional expert and administrative control: *A. S. M. Macgregor*.

Secretary, July, 1929—Thought and measurement in business: *W. H. Coates*.

AUSTRALIA AND NEW ZEALAND—

Economic Record, May, 1929—The administration of government enterprises: *F. A. Bland*. Some statistical aspects of Australian industry: *C. H. Wickens*. The post-war sex and age constitution of the New Zealand population and some of its economic consequences: *E. P. Neale*. Unemployment—some recent suggestions: *C. E. Martin*.

UNITED STATES—

American Academy of Political and Social Science, Annals, July, 1929—Present day causes of international friction and their elimination. With a supplement on lobbying by *E. B. Logan*.

UNITED STATES—*Contd.*

American Statistical Association, Journal, June, 1929—Special purpose indexes for the equation of exchange for the United States, 1919–27: *Morris A. Copeland*. On the annual revision of forecasting formulas based on partial regression equations: *A. J. Page*. A new index of the physical volume of Canadian business: *F. Gardiner Perry* and *A. G. Silberman*. The use of isorropic lines in determining regression surfaces: *F. V. Waugh*. Statistics and economic forecasting: *E. M. Burns*.

Journal of Political Economy, June, 1929—Recent Federal Reserve policy: *Harold L. Reed*. Agrarian problems of modern Japan, II: *Dorothy J. Orchard*. Morgenstern on economic forecasting: *Arthur W. Marget*.

Review of Economic Statistics, May, 1929—Review of the first quarter of the year: Editorial. Gold production: a survey and forecast: *Joseph Kitchen*. Revised index of the volume of manufacture: *W. Floyd Maxwell*. The census of distribution: *P. T. Cherington*.

ARGENTINA—

Revista de Ciencias Económicas—

January, 1929—El petróleo—su importancia y legislación: *Juan J. Guareski*.

February, 1929—La teoria cuantitativa: *Juan Demaria*.

March, 1929—La crisis ganadera y la marina mercante—nuevos regimenes comerciales para la producción y la industria: *Alfredo Hudson*.

DENMARK—

Nationaløkonomisk Tidsskrift, Hæft 2-3, 1929—Dansk Landbrug under Krisen: *Thomas Junker*. Arvskatt som Medel til økonomisk Utjämning: *Ernst Wigforss*. Betingelsen for konjunkturbevaegelsesernes Fremkomst: *Jørgen Pedersen*.

EGYPT—

L'Égypte Contemporaine, May, 1929—L'industrie égyptienne. Préjugés et errements: *I. G. Lévi*.

FRANCE—

Bulletin de Statistique et de Législation Comparée, March, 1929—L'impôt sur les voitures automobiles en 1928. Le métal argent dans le monde (production mondial, 1907–27, et stocks monétaires, 1920–27; cours de l'argent, 1924–28).

Journal des Économistes—

May, 1929—La Grande-Bretagne à la veille des élections: *Édouard Payen*. Le monopole du commerce extérieur en Russie soviétique: *S. Hargas*. Les grands marchés du monde et les routes commerciales: *R. J. Pierre*.

FRANCE—*Contd.*

June, 1929—Le budget de 1930: *Édouard Payen*. Politique commerciale et Malaise économique international: *Joseph Bonnet*. Les grandes compagnies de chemins de fer en 1928 (suite): *G. de Nourion*.

July, 1929—Le plan Young et les dettes interalliées: *Édouard Payen*. L'élevage dans le monde: *R. J. Pierre*.

Journal de la Société de Statistique de Paris, June, 1929—Quelques données concernant l'épargne en France depuis la guerre: *Henri Ulmer*. Chronique des banques et marchés monétaires: *Paul Ricard*.

La Réforme Sociale, May-June, 1929—La charte du travail et l'organisation syndicale en Italie: *E. Martin-Saint-Léon*.

Revue d'Économie Politique, May-June, 1929—Les prix: *L. Dugé de Bernonville*. La production industrielle: *J. Dessirier*. Les accords commerciaux et la politique douanière: *J. Naudin*.

GERMANY—

Blätter für Versicherungs-Mathematik, July, 1929—Eine Differentialgleichung der Wirtschaftsforschung und ihr Integral: *Paul Lorenz*. Ein empirisches Gesetz der säkularen Sterblichkeitsschwankungen und Folgerungen daraus für das Rentenversicherungsgeschäft: *C. W. Sachs*. Eine Darstellung der Sterbetafel: *H. Freudenberger*. Über die Altersverteilung der Verheirateten: *K. Goldziher*.

Weltwirtschaftliches Archiv, July, 1929—Nationalökonomie: *Werner Sombart*. Ein Versuch zur statistischen Analyse von Angebot und Nachfrage: *Wassily Leontief*. Strukturwandlungen und Konjunkturschwankungen im englischen Aussenhandel der Vorkriegszeit: *Konrad Zweig*.

Zeitschrift für die Gesamte Versicherungs-Wissenschaft, July, 1929—Die Wandlungen im Bevölkerungsaufbau und das Versicherungswesen: *Philipp Schwartz*. Kritisches über die Wirtschaftsstatistik der Versicherung: *C. Hollitscher*.

HUNGARY—

Journal de la Société Hongroise de Statistique, July-December, 1928—La statistique internationale des coopératives: *Charles Ihrig*. Critique des méthodes de la statistique conjoncturale: *Eugene Andreich*. Sur la statistique allemande et les conférences de Hambourg, tenues à l'automne de 1928: *Louis Thinning*.

ITALY—

Annali di Economia, July, 1929—Contributo alla ricerca dell' "Ottima imposta": *Luigi Einaudi*. Sviluppo ed organizzazione dei maggiori porti europei: *Vittorio Cornaro*.

ITALY—Contd.

Le Assicurazioni Sociali,

Anno V. No. 2.—L'assicurazione obbligatoria contro le malattie professionali: *Corrado Marchi*. I fattori finanziari dello sviluppo delle pensioni operaie: *Vincenzo Camanni*. Sullo sviluppo delle condizioni dei lavoratori in Germania: *R. Wilbandt*. Lavoro e collocamento dei minorati: *T. W. te Nuyt*.

Anno V. No. 3.—Le nuove provvidenze assicurative per la maternità: *Prof. S. A. Garbasso*. L'istituzione francese delle allocazioni familiari: *M. Bonvoisin*. La mortalità dei pensionati per invalidità nell'assicurazione facoltativa e nell'assicurazione obbligatoria. Di alcuni particolari elementi di lotta antitubercolare: *Emilia Sorrentini*.

La Riforma Sociale, May-June, 1929—Costi comparati e valore internazionale: *A. Cabriati*. Di alcuni effetti dell'estinzione del debito pubblico mediante un'imposta sul capitale: *M. Fasiani*.

Giornale degli Economisti e Rivista di Statistica, April, 1929—Ancora due parole sulla rendita del consumatore: *U. Gobbi*. Un recentissimo programma socialista di politica agraria: *Fabio Luzzato*. Investment trust: *Mario Pagano*.

ROUMANIA—

L'Économiste Roumain, June, 1929—Les forêts roumaines: *G. Ioanitsiu*.

SWITZERLAND—

Journal de Statistique et Revue Économique Suisse—

Fasc. 1. 1929—Die Bedeutung der Frauenarbeit für die Volkswirtschaft: *Dora Schmidt*. Die internationale Konferenz für Wirtschaftsstatistik: *Louise Sommer*.

Fasc. 2. 1929—Problème der vergleichenden schweizerischen Steuer- und Finanzstatistik: *Camille Higy*. Zur Korrelation zwischen den Heiratsaltern der Ehegatten in der Schweiz: *O. Schenker*. Sur l'ajustement des tables de mortalité pour les âges auxquels la formule de Makeham n'est pas applicable: *C. Willegens*.

INTERNATIONAL—

International Labour Review—

June, 1929—The international regulation of hours of work of salaried employees: *R. Furs*.

July, 1929—The functions of the International Labour Organisation: *J. Oudegeest*. Public utility house building, 1: *Käthe Liepmann*. Recent developments in industrial co-operation in the United States and Canada: *J. H. Richardson*.

Metron, Vol. VII. No. 4.—An application of Theile's semi-invariants to the sampling problem: *O. C. Craig*. Une formulation mathématique de la loi de la population: *Jacques Deleusky*. Das Volkseinkommen Alt-Oesterreichs und seine Verteilung auf die Nachfolgestaaten: *Ernst Warzner*.

LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part III, 1929, the Society has received the publications enumerated below:—

I.—OFFICIAL PUBLICATIONS.

(a) United Kingdom and its several Divisions.

United Kingdom—*Overseas Trade, Department of—*

Reports on the financial and economic conditions, etc. as follows: British Malaya (1928), 3s.; Canada (April, 1929), 3s.; Denmark, with an annex on Iceland, 1s. 6d.; Italy, 3s.; Norway (1927–28), 2s.; Roumania (April, 1929), 1s. 6d.

England and Wales—

Industrial Fatigue Research Board—Report No. 56. The effects of monotony in work. 53 pp. 1929. 2s. (H.M. Stationery Office.)

Northern Ireland—

Population Census, 1926. General report. 81 fol. pp. Belfast, 1929, 10s. 6d. (Government of Northern Ireland.)

(b) India, Dominions and Protectorates.

India—

Gazetteers—Madras District. Statistical appendices for the Nilgiri Dist. 88 pp. Rs. 2; Chittoor Dist. 65 pp. 12 as.; Kurnool Dist. 56 pp. 14 as. Madras, 1928. (High Commissioner.)

Canada—

Dominion Bureau of Statistics. General Statistics Branch—The employment position, 1929. January–May. Ottawa, 1929. Annual review of employment in Canada, 1928. 23 fol. pp. Ottawa, 1929. (Mr. S. A. Cudmore.)

New Zealand—

Population Census, 1926. 28 pp. Wellington, 1929. 2s. (Census and Statistics Office.)

Zanzibar—

Statistics of the Zanzibar Protectorate, 1893–1928. 24 pp. Zanzibar, 1929. (Mr. H. R. Crofton.)

(c) Foreign Countries.

Denmark—

Industrie, commerce et transport selon le recensement 1925. 335 pp. Copenhagen, 1929. (Det statistiska Departement.)

Germany—*Statistik des Deutschen Reichs—*

Band 348. Einkommen- und Körperschaftsteuerveranlagung für 1925. 429 pp. Berlin, 1929. Rm. 25. (Statistisches Reichsamt.)

Volks-, Berufs- und Betriebszählung. Band 402. Teil III; Band 406; Band 416. Heft 9a; Band 417. Heft 10b.

Vierteljahrshefte. Die Studierenden an den deutschen Hochschulen im Sommersemester 1928. 57 pp. Berlin, 1929. Rm. 5. (*Id.*)

(c) Foreign Countries—*Contd.***Netherlands—**

Bureau de Statistique de la Commune d'Amsterdam. Communication statistique No. 85. Le développement de l'enseignement public et privé à Amsterdam. lxx + 125 pp. Amsterdam: Meulenhoff, 1929. f 2.50. (The Bureau.)

La Chambre de Commerce Internationale. Gestion des entreprises publiques et privées aux Pays-bas. xviii + 96 pp. Le Haye: Martinus Nijhoff, 1929. (La Chambre de Commerce.)

Persia—**Ministry of Finance—**

Twentieth Quarterly Report, June–September, 1927. (The Anglo-Persian Oil Company.)

Twenty-second Quarterly Report, December, 1927–March, 1928. (*Id.*)

Twenty-third Report, March–September, 1928. (*Id.*)

Statistique Commerciale—Tableau General du commerce avec les pays étrangers, 1927–28. Teheran, 1928. (*Id.*)

Ukraine—

L'Académie des Sciences Oukrainienne. Recueil de la classe des sciences sociales-economiques. Nos. 19. Travaux de la commission pour l'étude de l'économie oukrainienne, 370 pp. (French summary.) 20. Travaux de la commission pour l'étude des finances. 160 pp. 21. Travaux de la commission pour l'étude des finances. 44 pp. 23. Travaux du séminaire pour l'étude de l'économie nationale de l'oukraine. 240 pp. Kiev, 1929. (L'Académie.)

United States—**Commerce, Department of—**

Domestic series, No. 5. Market research agencies. A guide to publications and activities relating to domestic marketing. vi + 206 pp. Washington, 1928. 15 cents. (The Department.)

Foreign and Domestic Commerce, Bureau of. Publication of the bureau. 100 pp. Washington, 1928. (*Id.*)

Labor, Department of—

Labor Statistics, Bureau of. Bulletin Nos. 475. Productivity of labor in newspaper printing. viii + 253 pp. 50 cents. 484. Wages and hours of labor: common street laborers. 44 pp. 10 cents. Washington, 1929. (The Department.)

Women's Bureau. Bulletin No. 71. Selected references on the health of women in industry. 8 pp. Washington, 1929. (*Id.*)

California. State Fisheries Laboratory. Fish Bulletins. Nos. 15–16. California, 1929. (The Laboratory.)

(d) International.

League of Nations—**Economic and Financial Section—**

Economic Committee. Recommendations of the Committee relating to commercial policy. 14 pp. Geneva, 1929. (The League.)

Economic Consultative Committee. Application of the recommendations of the International Economic Conference. 1 fol. p. Geneva, 1929. (*Id.*)

Financial Committee. Report to the Council on the work of the 35th session of the Committee and resolution adopted by the Council at its 55th session, June, 1929. 5 fol. pp. Geneva, 1929. (*Id.*)

Refugee Settlement Commission. Settlement of Bulgarian refugees. 11th report of the Commissioner of the League. 9 pp. Geneva, 1929. (*Id.*)

22nd quarterly report of the Commission. 14 fol. pp. Geneva, 1929. (*Id.*)

International Labour Office—

Studies and Reports. Series N. (Statistics.) No. 14. Methods of compiling statistics of coal-mining accidents. 90 pp. Geneva, 1929. 50 cents. Published in the U.K. by P. S. King, 2s.

II.—AUTHORS AND MISCELLANEOUS.

- Barriol (A.)*, *Brochu (I.)*, and *Bernard (A.)*. L'Emprunt de la ville de Paris. 4 pp. Notes sur l'opération de conversion et de remboursement des obligations de la caisse autonome et de consolidation des bons de la défense nationale. 4 pp. Reprints from *Journal des Économistes*. (The Authors.)
- Batten (Edward)*. Nationalism, politics, and economics. x + 135 pp. London: P. S. King, 1929. 7s. 6d. (The Publishers.)
- Berkson (Joseph)*. A probability nomogram for estimating the significance of rate differences. 5 pp. Reprint from *American Journal of Hygiene*, May, 1929. (Prof. L. J. Reed.)
- Burgess (Robert Wilbur)*. Introduction to the mathematics of statistics. Ed. by John Wesley Young. viii + 304 pp. London: Harrap, 10s. 6d. (The Publishers.)
- Cannan (Edwin)*. A review of economic theory. x + 448 pp. London: P. S. King, 1929. 16s. (The Publishers.)
- Dunn (Halbert L.)*. Application of statistical methods in physiology. 24 pp. Reprint from *Physiological Reviews*, Vol. ix. No. 2. (Prof. L. J. Reed.)
- Hall (Lincoln W.)*. An approach to definite forecasting. 142 pp. Philadelphia: The University. London: H. Milford, 1920. 12s. 6d. (The Publishers.)
- Haynes (T. H.)*. Imperial ethics. 10 pp. London: St. Catherine Press & Nisbet, 1912. 2d. (Mrs. Haynes.)
- An Imperial Customs Union or Commercial Federation of the British Empire. An abridged essay. 34 pp. London: Hayman, Christy & Lilley, 1895. 1s. 6d. (*Id.*)
- International fishery disputes. 24 pp. London: Paris and Melbourne: Cassell, 1891. 1s. (*Id.*)
- Northern Australia and the fate of the Aborigines. 16 pp. London: British Australasian (1910) Ltd., 1928. 6d. (*Id.*)
- The state of the Sulu islands and the sultanate. 34 pp. London, 1927. 2s. 6d. (*Id.*)
- A survey of Canadian imports and the results of preference. 16 pp. London: Daily Chronicle, 1907. 2d. (*Id.*)
- Territorial waters and ocean fishery rights. Paper read before the Association for the Reform and Codification of the Law of Nations, at the Guildhall, London, 1893. 20 pp. London: Spottiswoode, 1893. (*Id.*)
- The veto of the crown. 15 pp. 1893. 3d. (*Id.*)
- Griziotti (Benvenuto)*. Principi di politica diritto e scienza delle finanze. 324 pp. Padova: Milani Bros., 1929. 35 Lit. (The Publishers.)
- Gumbel (E. J.)*. Bestimmung der biometrischen Funktionen aus der Wahrscheinlichkeitstheorie. 10 pp. Reprint, 1929. (The Author.)
- Illinois, University of. Bulletin No. 25. The determination of secular trends. 71 pp. Urbana: The University, 1929. (The University.)
- Ingeniörsvetenskapsakademierna. Handlingar Nr. 93. 347 pp. Stockholm, 1929. (Ingeniörsvetenskapsakademierna.)
- Institut für Konjunkturforschung. Die Lage der verarbeitenden Industrie im Lichte der Leipziger Frühjahrsmesse 1929, mit einer Sonderdarstellung: Exportförderung. 96 pp. Berlin: Reimar Hobbing. (Institut für Konjunkturforschung.)
- Japan Advertiser. Enthronement of the one hundred and twenty-fourth Emperor of Japan. xvi + 179 pp. Tokyo: B. W. Fleisher, 1928. (Japanese Embassy.)
- Love (Albert G.)*. Somatological norms in tuberculosis and heart disease. 32 pp. Reprint from *Human Biology*, May 1929. (Prof. L. J. Reed.)
- Martin (P. W.)*. Unemployment and purchasing power. vii + 85 pp. London: P. S. King, 1929. 4s. 6d. (The Publishers.)
- Mysore, University of. Report on the statistical analysis of the medical examinations (1924-5 to 1926-7) of students of the University. K. B. Mathava. 80 pp. Mysore: The University, 1928. (The University.)

II.—Authors and Miscellaneous—Contd.

- National Association for the Prevention of Tuberculosis. The principles underlying a scheme of anti-tuberculosis measures in any countries. Sir Robert Philip, M.D., LL.B. 7 pp. Reprint from the "Transactions" of the fourteenth Annual Conference of the Association. (The Association.)
- Nankai University. Committee on Social Economic Research. Price Series. Bulletin No. 1. Wholesale prices and price index numbers in North China, 1913-20. 145 pp. Tientsin, 1929. (The University.)
- Pearl (Raymond) & Reed (Lowell J.). The population of an area around Chicago and the logistic curve. 2 pp. Reprint from the Journal of the American Statistical Association, March, 1929. (Prof. L. J. Reed.)
- Peddle (J. Taylor). The producers' case for monetary reform. Is Great Britain now a second-rate power? 3rd ed. 33 pp. British Economic Federation. 6d. (Messrs. P. S. King.)
- Pigou (A. C.). The social economics of welfare. 3rd ed. xxxi + 835 pp. London: Macmillan, 1929. 30s. (The Publishers.)
- The functions of economic analysis. Barnett House Papers, No. 12. 22 pp. London: H. Milford, 1929. 1s. (The Publishers.)
- Railway Accounting Officers' Association. The President's address, 1929. H. W. Johnson. 6 pp. Transportation changes since 1920. W. J. Cunningham. Address at the forty-first Annual General Meeting, May, 1929. 10 pp. (The Association.)
- Reed (Lowell J.). Correlations between climatic factors and death rates. 3 pp. Reprint from Proceedings of the International Mathematical Congress, 1924. (The Author.)
- and Berkson (Joseph). The application of the logistic function to experimental data. 20 pp. Reprint from Journal of Physical Chemistry, May, 1929. (Id.)
- Robertson (D. H.). Money. New ed. revised. xiv + 181 pp. London: Nisbet, 1928. 5s. (Purchased.)
- Sée (Henri). Esquisse d'une histoire économique et sociale de la France depuis les origines jusqu'à la guerre mondiale. 560 pp. Paris: Felix Alcan, 1929. 50 fr. (The Publishers.)
- Smithsonian Institution. Miscellaneous collections. Publication 3019. World weather records. 28 pp. Washington: The Institution, 1929. (The Institution.)
- Virginia, University of. Research in the social sciences. Edited, with an introduction, by Wilson Gee. x + 305 pp. New York and London: Macmillan, 1929. 8s. 6d. (The Publishers.)
- Wagemann (Ernst). Allgemeine Geldlehre. Band I. Theorie des Geldwerts und Währung. 367 pp. Jena: Fischer, 1923. (The Author.)
- Britisch-westindische Wirtschaftspolitik. Ein Beitrag zur Beurteilung moderner Kolonialprobleme. xii + 175 pp. Leipzig: Duncker & Humblot, 1909. (Id.)
- Konjunkturlehre. Eine Grundlegung zur Lehre vom Rhythmus der Wirtschaft. xvi + 301 pp. Berlin: Reimar Hobbing, 1928. (Id.)
- Die Wirtschaftsverfassung der Republik Chile. Zur Entwicklungsgeschichte der Geldwirtschaft und der Papierwährung. vii + 253 pp. München & Leipzig: Duncker & Humblot, 1913. (Id.)
- Wishart (J.). The correlation between product moments of any order in samples from a normal population. 32 pp. Reprint from Proceedings of the Royal Society of Edinburgh, 1929. 1s. (The Author.)
- A problem in combinatorial analysis giving the distribution of certain moment statistics. 13 pp. Reprint from Proceedings of the London Mathematical Society. January, 1928. (Id.)
- Zahn (Friedrich). Die familienpolitische Enquête der internationalen Vereinigung für sozialen Fortschritt. (Reprint from Allgemeines Statistisches Archiv.) 21 pp. Jena: Fischer, 1929. (The Author.)
- Wirtschaftsenquete. Sonderabdruck aus Handwörterbuch der Staatswissenschaften. 14 pp. Jena: Fischer, 1929. (Id.)

ANNUAL LIST OF ADDITIONS TO THE LIBRARY.

Since the issue of Part IV, 1928, the Society has received, by presentation or purchase, the periodical (official and other) publications enumerated below.

(a) United Kingdom and its several Divisions.

United Kingdom—

Bankruptcy, Report, 1927. Board of Trade Journal, 1928-29. Crown Lands, Report, 1928. Customs and Excise, Report, 1927-28. Development Commission, Report, 1927-28. Electricity Commission: Report, 1927-28. Factories and Workshops, Report of Chief Inspector, 1927. Finance Accounts, 1927-28. Friendly Societies, Report, 1927-28. Health of the Army, Report, 1927. Imperial Institute, Report, 1928. Industrial Insurance, Report of Commissioner, 1928. Inland Revenue, Report of Commissioners, 1927-28. Labour Gazette, 1928-29. Labour, Ministry of, Report, 1928. Licensing Statistics, 1927. Mineral Industry of British Empire and Foreign Countries, Statistical Summary, 1925-27. Mines Department: Report, 1928; List of Mines, 1927; Fatal Accidents, 1928; Report of Electrical Inspector, 1927. Mint Report, 1927. National Debt Returns, 1927-28. Navigation and Shipping, 1927. Public Works Loan Board Report, 1927-28. Railway Accidents, 1928. Railways, Capital, etc., 1927. Road Fund Report, 1927-28. Shipping (Casualties and Deaths on Vessels, 1927. Statistical Abstract for the United Kingdom, 1923-27. Statistical Abstract for British Overseas Dominions, 1922-25. Trade: Annual Statement, 1927; Monthly Trade Returns; Quarterly Returns of Trade and Commerce of Foreign Countries and British Possessions. War Office Library, Annual Supplement to Subject Index, 1928.

England and Wales—

Agricultural Statistics, 1928. Agricultural Market Report (weekly). Agriculture, Ministry of, Journal (monthly). Ecclesiastical Commissioners, Report, 1926-27. Education. Report, 1928. Health Ministry: Annual Report, 1928-29. Annual Report of Chief Medical Officer, 1927; Health of School Child, 1927. Judicial Statistics: Civil, 1927; Criminal, 1927. Local Taxation Returns, 1926-27. Poor Law Relief Returns (quarterly). Prisons, Report of Commissioners, 1927. Registrar-General: Statistical Review, 1927; Quarterly and Weekly Returns. Sea Fisheries, Report, 1927.

London. L.C.C.: Annual Report; Gazette; London Statistics, 1926-27; Statistical Report, Metropolitan Asylums Board, Report for 1928-29. Metropolitan Water Board, Report, 1927-28. Borough Accounts: Acton, Battersea, Hammersmith, Islington. M.O.H. Reports: Paddington, Poplar.

Municipal and other local returns. Accounts, 1927-28: Birmingham, Carlisle, Hull, Ipswich, Leicester, Liverpool, Manchester, Nottingham, Ossett, Southgate, Tunbridge Wells. M.O.H. Reports, 1927-28: Birkenhead, Birmingham, Derby, Liverpool, Manchester, Preston, Wigan, Wolverhampton.

Mersey Docks and Harbour Board, Accounts, 1927-28.

University Calendars, 1928-29: Liverpool, London, University College Manchester, Sheffield, University College of Wales.

(a) **United Kingdom and its several Divisions—Contd.****Scotland—**

Agriculture, Board of: Report, 1928; Agricultural Statistics, 1927. Education Reports, 1927-28. Judicial Statistics, 1927. Prison Commissioners, Report, 1928. Registrar-General, Annual Report, 1927; Quarterly and Weekly Returns.

Edinburgh. Municipal Accounts, 1928.

Aberdeen. M.O.H. Report, 1928.

Glasgow. M.O.H. Report, 1928.

Northern Ireland—

Registrar-General: Annual Report, 1927; Quarterly Returns.

Queen's University Calendar, 1928-29.

Periodicals, etc., and Miscellaneous issues of 1928 and 1929.

Brewers' Almanack and Wine and Spirit Trade Annual. Broomhall's Corn Trade Year-book. Burdett's Hospitals and Charities. Municipal Year-book. Post Magazine Almanack. Statesman's Year-book. Stock Exchange Official Intelligence. Banking Almanack. Daily Mail Year-book. People's Year-book. Whitaker's Almanack. Who's Who. Year-book of Learned Societies. South Wales Coal Annual.

The Accountant. Accountants' Magazine. Annals of Eugenics. Banker's Magazine. Biometrika. Colliery Guardian. Colombian Trade Review. Commercial World. Compendium of Commerce. Economica. Economic Journal. Economist. Fireman. Financial Notes. Financial Review of Reviews. Illuminating Engineer. Insurance and Finance Chronicle. Insurance Record. Investors' Monthly Manual. Land and Liberty. London and Cambridge Economic Service Publications. Manchester Guardian, Commercial and Supplements. National Temperance Quarterly. Nature. Post Magazine. Public Administration Journal. Public Health. Publishers' Circular. The Secretary. The Signal. Statist. Stock Exchange Gazette. Sugar Beet Review. The Times and Supplements. Tropical Agriculture. Wallis Index Cotton Circular. Westminster Bank Review.

Societies, Trade Associations, etc., Reports, etc., issues of 1928-29.

Auctioneers' and Estate Agents' Institute, Journal. British Association, Report. British Library of Political Science, Bulletin. British Waterworks Association, Official Circular. Carnegie United Kingdom Trust, Report. Chamber of Shipping, Annual Report. Chartered Institute of Secretaries, Proceedings, etc. Corporation of Foreign Bondholders, Report. Cremation Society, Transactions. East India Association, Journal. Eugenics Society, Review. Faculty of Actuaries, Transactions and List of Members. Federation of British Industries, Publications. Hospitals, Voluntary, in Great Britain, Reports. Institute of Actuaries, Journal and List of Members. Institute of Bankers, Journal. Institute of Chartered Accountants, List of Members. Institution of Civil Engineers, Proceedings. Iron and Steel Institute, Journal and List of Members. Liverpool Cotton Association, Annual and Weekly Circulars. Lloyd's: Annual Summary of World's Shipbuilding (Mercantile); Register of Shipping; Statistical Tables and Report. London Bankers' Clearing House, Report. London Chamber of Commerce, Journal. Manchester Statistical Society, Transactions. National Federation of Iron and Steel Manufacturers, Publications. National Temperance League, Report. Peabody Donation Fund, Report of Governors. Royal Agricultural Society of England, Journal. Royal Anthropological Institute, Journal. Royal College of Physicians of London, List of Fellows, etc. Royal College of Surgeons of England, Calendar. Royal Empire Society, United Empire. Royal Geographical Society, Geographical Journal. Royal

(a) United Kingdom and its several Divisions—*Contd.*

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